Video Cassette Recorder Deck: Turbo Drive APOLLO 13

Service
Service
Service

VR120/02/55/58
VR170/02/07/39/58
VR220/02/07/39/58
VR270B/02/07/39/58
VR270W/02/07/39/58
VR402/58
VR420/02/39/58
VR520/02/07/16/58
VR570/02/07/16/39/58
VR572/02/16
VR620/02/07/16/39/58
VR622/02/16
VR627/02/16
VR670B/02/07/16
VR670B/39/58
VR670W/02/07/16
VR670W/39/58
VR720/02/07/16/39/58
VR870CC/02/07/16
VR870CC/39/58
VR870L/02/07/16
VR870L/39/58
SB140/03/38
SB145/03/11
SB445/11/38
SB645/03/11/38
SB745/03/11/38
20DV30/39
45DV30/39
65DV30/39

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Service Manual

Contents Page

1 List of PWBs, Features, Technical specifications 3
2 Safety instructions, Modifications 10
3 Directions for use 12
4 Dismantling instructions 46
5 Service modes, Repair tips 49
6 Block diagrams, Waveforms, Wiring diagram 57
7 Circuit diagrams and PWB layouts 64
8 Electrical alignments 91
9 Circuit descriptions and List of abbreviations 97
10 Tape deck 113
11 Exploded views 124
12 Spare parts list 128

Survey of versions:

/02/03	PAL B/G, VPS/PDC
/05	PAL I, UK
/07	PAL I, Ireland
/11	PAL B/G, Belgium
/13	PAL B/G, Nordic
/16	PAL B/G, Spain / Nordic
/38/39	SECAM L, L' & PAL B/G, I
/55	PAL B/G, I, PAL/SECAM D/K
/58/59	PAL/SECAM B/G, D/K
/60	PAL/SECAM D/K

Survey of remote controls:

VR220/02/07/39/58 **VR420**/02/39/58	**RT112/111**	8622 661 12111
VR870L/02/07/16/39/58 **VR870CC**/02/07/16/39/58	**RT114/111**	8622 661 14111
SB140/03 **SB145**/03/11 **SB445**/11 **SB645**/03/11 **SB745**/03/11	**RT116/201**	8622 661 16201
SB140/38 **SB445**/38 **SB645**/38 **SB745**/38 **65DV30**/39 **45DV30**/39 **20DV30**/39	**RT116/204**	8622 661 16204
VR120/02/16/55/58 **VR402**/58 **VR520**/02/07/16/58	**RT121/101**	8622 661 21101
VR170/07/39/58 **VR270W**/02/07/39/58 **VR570**/02/07/16/39/58 **VR572**/02/16 **VR670W**/02/07/16/39/58	**RT121/111**	8622 661 21111
VR270B/02/07/39/58 **VR670B**/02/07/16/39/58	**RT121/121**	8622 661 21121
VR620/02/07/16/39/58 **VR622**/02/16	**RT123/111**	8622 661 23111
VR627/02/16 **VR720**/02/07/16/39/58	**RT128/112**	8622 661 28112

PHILIPS

PHILIPS

Contents Page

1 **List of PWBs, Features, Technical specifications** 3
Survey of sets and PWB's with software versions 3
Features 5
Technical specification 9

2 **Safety instructions, Modifications** 10
Safety instructions 10
Modifications 11

3 **Direction for use** 12
Remote control overview 12
Front overview of the sets 14
Direction for use introduction 16
Remote control codes 45

4 **Dismantling instructions** 46
Dismantling instructions 46
Dismantling of the motherboard/drive combination 47
Dismantling the drive 48

5 **Service modes, Repair tips** 49
Special functions 49
Service test program 49
Repair tips 53

6 **Block diagrams, Waveforms, Wiring diagram** 57
Block diagram Video 57
Block diagram Audio Mono 58
Block diagram Audio Stereo 59
Supply voltages and Bus diagram 60
Supply voltages and Bus diagram 61
Block diagram Central Control 62
Waveforms 63

7 **Circuit diagrams and PWB layouts** 64
Power supply (**PS**) 64
Display control (**AIO2**) 65
Central control (**AIO1**) 66
Deck control (**DE**) 67
Variant List Frontend (**FV**) 68
Frontend (**FV**) 69
FM stereo (**FM-ST**) 70
FM Stereo + Nicam (**FM-ST-NIC**) 71
Audio Linear (**AL**) 72
FM - Audio (**AF**) 73
Video Signal Processing - SECAM (**VS-SEC**) 74
Video Signal Processing (**VS**) 75
VPS/PDC & OSD Part (**VPO**) 76
In/Out Part (**IO**) 77
FOLLOW ME Part (**FOME**) 78
Wiring Diagram 79
Mother board - **solder** side 80
Mother board - **component** side 83
Connector print (**ACP10**) 84
Connector print (**ACP1**) 84
Connector print (**QBOE1**) 85
Connector print (**QBOG1**) 85
Connector print (**ACP35**) 86
Key print (**AKP35**) 87
Illumination print (**AKP13**) 88
Key print (**AKP36**) 89
Shuttle board (**ASP10**) 89
Shuttle board (**QKP21**) 89
Test point overview 90

Contents Page

8 **Electrical alignments** 91
Measuring instruments 91
Setting instructions 91
Video signal processing (**VS-SEC**) 91
Front End (**FV**) 92
Deck electronics (**DE**) 93
Servo System (**AIO1**) 93
Audio Linear (**AL**) 94
Display Control (**AIO2**) 94

9 **Circuit descriptions and List of abbreviations** 97
Switched-mode power supply PS (**PS** Part) 97
Operating unit (**DC** part) 98
Central Control (**AIO** part) 99
Deck electronics (**DE** part) 100
Front end (**FV** part) 101
Video signal processing VS (**VS** part) 102
Audio linear (**AL** part) 104
Audio HiFi - for stereo units (**AF** part) 105
IN/OUT (**IO** part) 105
Follow Me (**FOME** part) 106
VPS/PDC, on-screen display (**VPO** part) 106
Simple Blockdiagram 107
Simple Blockdiagram FM Audio / Linear Audio processing 109
List of abbreviations 110

10 **Tape deck** 113
Drive assembly 113
Adjustments 117
Deck exploded view (TOP) 120
Deck exploded view (BOTTOM) 121
Mechanical parts list 122

11 **Exploded views** 124
Exploded view set 124

12 **Spare parts list** 128

1. List of PWBs, Features, Technical specifications

1.1 Survey of sets and PWB's with software versions

	SYSTEMS											All in One-(AIO) µP Pos. 7899			key print connector print			TAPE DECK			
	System off air						Rec/Pb standard					Mobo			chapter 7			chapter 10			
												µP-ID No.									
												31	32	37							
	PAL BG	PAL I	SECAM BG	SECAM L/L'	PAL/SECAM DK	SECAM K1	PAL	SECAM	MESECAM	Pb NTSC on PAL TV	Pb Black & White	AC3P1 - xU	AC3B1 - xU	AC3P7 - xU	ACP 35	AKP 35	AKP 36	A12T-P2/0	A12T-P2/0LP	AT-S4/0	AT-S4/2
VR120/02	✓						✓				✓	✓						✓			
VR120/55	✓	✓	✓		✓		✓		✓	✓	✓	✓						✓			
VR120/58	✓		✓		✓		✓		✓	✓	✓	✓							✓		
VR170/02	✓						✓				✓		✓					✓			
VR170/07		✓					✓			✓	✓		✓						✓		
VR170/39	✓	✓	✓	✓			✓	✓	✓		✓		✓					✓			
VR170/58	✓		✓		✓		✓		✓	✓	✓		✓						✓		
VR220/02	✓						✓				✓		✓					✓			
VR220/07		✓					✓			✓	✓		✓						✓		
VR220/39	✓	✓	✓	✓			✓	✓	✓		✓		✓					✓			
VR220/58	✓		✓		✓		✓		✓	✓	✓		✓						✓		
VR270B/02	✓						✓				✓	✓						✓			
VR270B/07		✓					✓				✓	✓						✓			
VR270B/39	✓	✓	✓	✓			✓	✓	✓		✓	✓						✓			
VR270B/58	✓		✓		✓		✓		✓	✓	✓	✓						✓			
VR270W/02	✓						✓				✓	✓						✓			
VR270W/07		✓					✓				✓	✓						✓			
VR270W/39	✓	✓	✓	✓			✓	✓	✓		✓	✓						✓			
VR270W/58	✓		✓		✓		✓		✓	✓	✓	✓						✓			
VR402/58	✓		✓		✓		✓		✓	✓	✓	✓								✓	
VR420/02	✓						✓			✓	✓		✓							✓	
VR420/39	✓	✓	✓	✓			✓	✓	✓	✓	✓		✓							✓	
VR420/58	✓		✓		✓		✓		✓	✓	✓		✓							✓	
VR520/02	✓						✓				✓		✓								✓
VR520/07		✓					✓				✓		✓								✓
VR520/16	✓						✓				✓		✓								✓
VR520/58	✓		✓		✓		✓		✓	✓	✓		✓								✓
VR570/02	✓						✓			✓	✓		✓								✓
VR570/07		✓					✓			✓	✓		✓								✓
VR570/16	✓						✓			✓	✓		✓								✓
VR570/39	✓	✓	✓	✓			✓	✓	✓	✓	✓		✓								✓
VR570/58	✓		✓		✓		✓		✓	✓	✓		✓								✓
VR572/02	✓						✓			✓	✓		✓								✓
VR572/16	✓						✓			✓	✓		✓								✓
VR620/02	✓						✓			✓	✓			✓							✓
VR620/07		✓					✓			✓	✓			✓							✓
VR620/16	✓						✓			✓	✓			✓							✓
VR620/39	✓	✓	✓	✓			✓	✓	✓	✓	✓			✓							✓
VR620/58	✓		✓		✓		✓		✓	✓	✓			✓							✓
VR622/02	✓						✓			✓	✓			✓							✓
VR622/16	✓						✓			✓	✓			✓							✓

	SYSTEMS											All in One-(AIO) µP Pos. 7899			key print connector print			TAPE DECK			
	System off air						Rec/Pb standard					Mobo			chapter 7			chapter 10			
												µP-ID No.									
												31	32	37							
	PAL BG	PAL I	SECAM BG	SECAM L/L'	PAL/SECAM DK	SECAM K1	PAL	SECAM	MESECAM	Pb NTSC on PAL TV	Pb Black & White	AC3P1 - xU	AC3B1 - xU	AC3P7 - xU	ACP 35	AKP 35	AKP 36	A12T-P2/0	A12T-P2/0LP	AT-S4/0	AT-S4/2
VR627/02	✓						✓			✓	✓			✓							✓
VR627/16	✓						✓			✓	✓			✓							✓
VR670B/02	✓						✓			✓	✓		✓								✓
VR670B/07		✓					✓			✓	✓		✓								✓
VR670B/16	✓						✓			✓	✓		✓								✓
VR670B/39	✓	✓	✓	✓			✓	✓	✓	✓	✓		✓								✓
VR670B/58	✓		✓		✓		✓		✓	✓	✓		✓								✓
VR670W/02	✓						✓			✓	✓		✓								✓
VR670W/07		✓					✓			✓	✓		✓								✓
VR670W/16	✓						✓			✓	✓		✓								✓
VR670W/39	✓	✓	✓	✓			✓	✓	✓	✓	✓		✓								✓
VR670W/58	✓		✓		✓		✓		✓	✓	✓		✓								✓
VR720/02	✓						✓			✓	✓			✓			✓				✓
VR720/07		✓					✓			✓	✓			✓			✓				✓
VR720/16	✓						✓			✓	✓			✓			✓				✓
VR720/39	✓	✓	✓	✓			✓	✓	✓	✓	✓			✓			✓				✓
VR720/58	✓		✓		✓		✓		✓					✓			✓				✓
VR870CC/02	✓						✓			✓	✓			✓	✓	✓					✓
VR870CC/07		✓					✓			✓	✓			✓	✓	✓					✓
VR870CC/16	✓						✓			✓	✓			✓	✓	✓					✓
VR870CC/39	✓	✓	✓	✓			✓	✓	✓	✓	✓			✓	✓	✓					✓
VR870CC/58	✓		✓		✓		✓		✓	✓	✓			✓	✓	✓					✓
VR870L/02	✓						✓			✓	✓			✓	✓	✓					✓
VR870L/07		✓					✓			✓	✓			✓	✓	✓					✓
VR870L/16	✓						✓			✓	✓			✓	✓	✓					✓
VR870L/39	✓	✓	✓	✓			✓	✓	✓	✓	✓			✓	✓	✓					✓
VR870L/58	✓		✓		✓		✓		✓	✓	✓			✓	✓	✓					✓
SB140/03	✓						✓				✓	✓						✓			
SB140/38	✓	✓	✓	✓			✓	✓	✓		✓	✓						✓			
SB145/03	✓						✓			✓	✓		✓					✓			
SB145/11	✓						✓			✓	✓		✓					✓			
SB445/11	✓						✓			✓	✓		✓							✓	
SB445/38	✓	✓	✓	✓			✓	✓	✓	✓	✓		✓							✓	
SB645/03	✓						✓			✓	✓		✓								✓
SB645/11	✓						✓			✓	✓		✓								✓
SB645/38	✓	✓	✓	✓			✓	✓	✓	✓	✓		✓								✓
SB745/03	✓						✓			✓	✓		✓								✓
SB745/11	✓						✓			✓	✓		✓								✓
SB745/38	✓	✓	✓	✓			✓	✓	✓	✓	✓		✓								✓
20DV30/39	✓	✓	✓	✓			✓	✓	✓		✓	✓						✓			
45DV30/39	✓	✓	✓	✓			✓	✓	✓	✓	✓		✓							✓	
65DV30/39	✓	✓	✓	✓			✓	✓	✓	✓	✓		✓								✓

1.2 Features

	VR120/02	VR120/55	VR120/58	VR170/02	VR170/07	VR170/39	VR170/58	VR220/02	VR220/07	VR220/39	VR220/58	VR270B/02	VR270B/07	VR270B/39	VR270B/58	VR270W/02	VR270W/07	VR270W/39	VR270W/58	VR402/58	VR420/02
General																					
Auto Standby On/Off	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Backup Presets 1yr	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Backup Clock / Timer 3hrs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Events / month	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Low Power Standby Power Cons. [Watts]	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
Tuning - presets (only channel input)	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
Systems																					
Hyperband, UHF, VHF	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mono	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
German Stereo																					
NICAM																					
Splitter						✓				✓				✓				✓			
Auto Seek					✓				✓				✓				✓				
Mechanism																					
Number of Video Heads	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4
FM audio heads for stereo																					
Head Cleaning Mode/automatic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Winding Time (E180) sec	260	260	260	100	100	100	100	100	100	100	100	260	260	260	260	260	260	260	260	260	100
Rewind Time (E180) sec	170	170	170	100	100	100	100	100	100	100	100	170	170	170	170	170	170	170	170	170	100
Quick View	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tape Counter lin. Relative (h.m.s.)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tape Counter Time Left (h.m)				✓	✓	✓	✓	✓	✓	✓	✓										✓
VISS: next/prev. index / blank tape search	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Features																					
Plug & Play				✓	✓	✓	✓	✓	✓	✓	✓										✓
On Screen Display (OSD)				✓	✓	✓	✓	✓	✓	✓	✓										✓
Welcome Screen				✓	✓	✓	✓	✓	✓	✓	✓										✓
Auto Install/Search/Store/Tuning	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Easy link / NexTView Link (P50)																					
Follow TV (analog)				✓	✓	✓	✓	✓	✓	✓	✓										✓
Direct Record				✓	✓	✓	✓	✓	✓	✓	✓										✓
16:9 (pin 8)								✓	✓	✓	✓										✓
Digital Studio Picture Control	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Commercial Skip	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Turbo Timer	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Daily/Weekly				✓	✓	✓	✓	✓	✓	✓	✓										✓
Showview / VideoPlus+				✓	✓	✓	✓	✓	✓	✓	✓										✓
ShowView Mapping																					✓
VPS + PDC (VPD)				✓	✓	✓	✓	✓	✓	✓	✓										✓
PDC (Time/Date) download				✓	✓	✓	✓	✓	✓	✓	✓										✓
Net-name detection				✓	✓	✓	✓	✓	✓	✓	✓										✓
Record Link / Scart 2								✓	✓	✓	✓										✓
Sat control via Mouse																					
Child Lock	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
VCR1/VCR2																					
OTR	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Long Play			✓		✓		✓		✓		✓									✓	✓
Auto LP											✓										✓
Tape List																					
SMART Picture																					
Connectors																					
Number of Scart connectors	1	1	1	2	2	2	2	2	2	2	2	1	1	2	1	1	1	2	1	1	2
Audio out cinch rear																					
Audio/Video in cinch front																					

	VR420/39	VR420/58	VR520/02	VR520/07	VR520/16	VR520/58	VR570/02	VR570/07	VR570/16	VR570/39	VR570/58	VR572/02	VR572/16	VR620/02	VR620/07	VR620/16	VR620/39	VR620/58	VR622/02	VR622/16
General																				
Auto Standby On/Off	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Backup Presets 1yr	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Backup Clock / Timer 3hrs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Events / month	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Low Power Standby Power Cons. [Watts]	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
Tuning - presets (only channel input)	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
Systems																				
Hyperband, VHF, UHF	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mono	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
German Stereo			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
NICAM				✓	✓	✓		✓	✓	✓	✓		✓		✓	✓	✓	✓		✓
Splitter	✓									✓							✓			
Auto Seek				✓				✓							✓					
Mechanism																				
Number of Video Heads	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
FM audio heads for stereo			2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Head Cleaning Mode/automatic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Winding Time (E180) sec	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Rewind Time (E180) sec	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Quick View	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tape Counter lin. Relative (h.m.s.)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tape Counter Time Left (h.m)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
VISS: next/prev. index / blank tape search	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Features																				
Plug & Play	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
On Screen Display (OSD)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Welcome Screen	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Auto Install/Search/Store/Tuning	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Easy link / NexTView Link (P50)																				
Follow TV (analog)	✓	✓					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Direct Record	✓	✓					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
16:9 (pin 8)	✓	✓					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Digital Studio Picture Control	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Commercial Skip	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Turbo Timer	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Daily/Weekly	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Showview / VideoPlus+	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ShowView Mapping	✓	✓												✓	✓	✓	✓	✓	✓	✓
VPS + PDC (VPD)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PDC (Time/Date) download	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Net-name detection	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Record Link / Scart 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sat control via mouse																				
Child Lock	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
VCR1/VCR2														✓	✓	✓	✓	✓	✓	✓
OTR	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Long Play	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Auto LP	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tape List														✓	✓	✓	✓	✓	✓	✓
SMART Picture																				
Connectors																				
Number of Scart connectors	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Audio out cinch rear			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Audio/Video in cinch front														✓	✓	✓	✓	✓	✓	✓

1.2 Features

	VR120/02	VR120/55	VR120/58	VR170/02	VR170/07	VR170/39	VR170/58	VR220/02	VR220/07	VR220/39	VR220/58	VR270B/02	VR270B/07	VR270B/39	VR270B/58	VR270W/02	VR270W/07	VR270W/39	VR270W/58	VR402/58	VR420/02
General																					
Auto Standby On/Off	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Backup Presets 1yr	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Backup Clock / Timer 3hrs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Events / month	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Low Power Standby Power Cons. [Watts]	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
Tuning - presets (only channel input)	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
Systems																					
Hyperband, UHF, VHF	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mono	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
German Stereo																					
NICAM																					
Splitter						✓				✓				✓				✓			
Auto Seek					✓				✓				✓				✓				
Mechanism																					
Number of Video Heads	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4
FM audio heads for stereo																					
Head Cleaning Mode/automatic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Winding Time (E180) sec	260	260	260	100	100	100	100	100	100	100	100	260	260	260	260	260	260	260	260	260	100
Rewind Time (E180) sec	170	170	170	100	100	100	100	100	100	100	100	170	170	170	170	170	170	170	170	170	100
Quick View	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tape Counter lin. Relative (h.m.s.)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tape Counter Time Left (h.m)				✓	✓	✓	✓	✓	✓	✓	✓										✓
VISS: next/prev. index / blank tape search	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Features																					
Plug & Play				✓	✓	✓	✓	✓	✓	✓	✓										✓
On Screen Display (OSD)				✓	✓	✓	✓	✓	✓	✓	✓										✓
Welcome Screen				✓	✓	✓	✓	✓	✓	✓	✓										✓
Auto Install/Search/Store/Tuning	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Easy link / NexTView Link (P50)																					
Follow TV (analog)				✓	✓	✓	✓	✓	✓	✓	✓										✓
Direct Record				✓	✓	✓	✓	✓	✓	✓	✓										✓
16:9 (pin 8)								✓	✓	✓	✓										✓
Digital Studio Picture Control	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Commercial Skip	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Turbo Timer	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Daily/Weekly				✓	✓	✓	✓	✓	✓	✓	✓										✓
Showview / VideoPlus+				✓	✓	✓	✓	✓	✓	✓	✓										✓
ShowView Mapping																					✓
VPS + PDC (VPD)				✓	✓	✓	✓	✓	✓	✓	✓										✓
PDC (Time/Date) download				✓	✓	✓	✓	✓	✓	✓	✓										✓
Net-name detection				✓	✓	✓	✓	✓	✓	✓	✓										✓
Record Link / Scart 2								✓	✓	✓	✓										✓
Sat control via Mouse																					
Child Lock	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
VCR1/VCR2																					
OTR	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Long Play			✓		✓		✓		✓		✓									✓	✓
Auto LP											✓										✓
Tape List																					
SMART Picture																					
Connectors																					
Number of Scart connectors	1	1	1	2	2	2	2	2	2	2	2	1	1	2	1	1	1	2	1	1	2
Audio out cinch rear																					
Audio/Video in cinch front																					

	VR627/02	VR627/16	VR670B/02	VR670B/07	VR670B/16	VR670B/39	VR670B/58	VR670W/02	VR670W/07	VR670W/16	VR670W/39	VR670W/58	VR720/02	VR720/07	VR720/16	VR720/39	VR720/58	VR870CC/02	VR870CC/07	VR870CC/16
General																				
Auto Standby On/Off	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Backup Presets 1yr	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Backup Clock / Timer 3hrs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Events / month	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Low Power Standby Power Cons. [Watts]	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
Tuning - presets (only channel input)	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
Systems																				
Hyperband, UHF, VHF	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mono	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
German Stereo	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
NICAM		✓		✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓	✓		✓	✓
Splitter						✓					✓					✓				
Auto Seek				✓					✓					✓					✓	
Mechanism																				
Number of Video Heads	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
FM audio heads for stereo	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Head Cleaning Mode/automatic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Winding Time (E180) sec	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Rewind Time (E180) sec	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Quick View	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tape Counter lin. Relative (h.m.s.)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tape Counter Time Left (h.m)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
VISS: next/prev. index / blank tape search	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Features																				
Plug & Play	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
On Screen Display (OSD)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Welcome Screen	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Auto Install/Search/Store/Tuning	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Easy link / NexTView Link (P50)																		✓	✓	✓
Follow TV (analog)	✓	✓											✓	✓	✓	✓	✓	✓	✓	✓
Direct Record	✓	✓											✓	✓	✓	✓	✓	✓	✓	✓
16:9 (pin 8)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Digital Studio Picture Control	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Commercial Skip	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Turbo Timer	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Daily/Weekly	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Showview / VideoPlus+	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ShowView Mapping	✓	✓											✓	✓	✓	✓	✓	✓	✓	✓
VPS + PDC (VPD)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PDC (Time/Date) download	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Net-name detection	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Record Link / Scart 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sat control via mouse													✓	✓		✓				
Child Lock	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
VCR1/VCR2	✓	✓											✓	✓	✓	✓	✓	✓	✓	✓
OTR	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Long Play	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Auto LP	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tape List	✓	✓											✓	✓	✓	✓	✓			
SMART Picture	✓	✓											✓	✓	✓	✓	✓	✓	✓	✓
Connectors																				
Number of Scart connectors	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Audio out cinch rear	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Audio/Video in cinch front	✓	✓											✓	✓	✓	✓	✓	✓	✓	✓

	VR870CC/39	VR870CC/58	VR870L/02	VR870L/07	VR870L/16	VR870L/39	VR870L/58	SB140/03	SB140/38	SB145/03	SB145/11	SB445/11	SB445/38	SB645/03	SB645/11	SB645/38	SB745/03	SB745/11	SB745/38	20DV30/39	45DV30/39	65DV30/39
General																						
Auto Standby On/Off	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Backup Presets 1yr	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Backup Clock / Timer 3hrs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Events / month	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Low Power Standby Power Cons. [Watts]	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
Tuning - presets (only channel input)	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
Systems																						
Hyperband, UHF, VHF	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mono	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
German Stereo	✓	✓	✓	✓	✓	✓	✓							✓	✓	✓	✓	✓	✓			✓
NICAM	✓	✓		✓	✓	✓	✓								✓	✓		✓	✓			✓
Splitter	✓					✓			✓				✓			✓			✓	✓	✓	✓
Auto Seek				✓																		
Mechanism																						
Number of Video Heads	4	4	4	4	4	4	4	2	2	2	2	4	4	4	4	4	4	4	4	2	4	4
FM audio heads for stereo	2	2	2	2	2	2	2							2	2	2	2	2	2			2
Head Cleaning Mode/automatic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Winding Time (E180) sec	100	100	100	100	100	100	100	260	260	260	260	260	260	260	260	260	100	100	100	260	260	260
Rewind Time (E180) sec	100	100	100	100	100	100	100	170	170	170	170	170	170	170	170	170	100	100	100	170	170	170
Quick View	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tape Counter lin. Relative (h.m.s.)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tape Counter Time Left (h.m)	✓	✓	✓	✓	✓	✓	✓										✓	✓	✓			
VISS: next/prev. index / blank tape search	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Features																						
Plug & Play	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
On Screen Display (OSD)	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Welcome Screen	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Auto Install/Search/Store/Tuning	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
easy link / NexTView Link (P50)	✓	✓	✓	✓	✓	✓	✓															
Follow TV (analog)	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Direct Record	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
16:9 (pin 8)	✓	✓	✓	✓	✓	✓	✓							✓	✓	✓	✓	✓	✓			✓
Digital Studio Picture Control	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Commercial Skip	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Turbo Timer	✓	✓	✓	✓	✓	✓	✓															
Daily/Weekly	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Showview / VideoPlus+	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
ShowView Mapping	✓	✓	✓	✓	✓	✓	✓															
VPS + PDC (VPD)	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
PDC (Time/Date) download	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Net-name detection	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Record Link / Scart 2	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Sat control via mouse																						
Child Lock	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
VCR1/VCR2	✓	✓	✓	✓	✓	✓	✓															
OTR	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Long Play	✓	✓	✓	✓	✓	✓	✓					✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Auto LP	✓	✓	✓	✓	✓	✓	✓										✓	✓	✓			
Tape List																						
SMART Picture	✓	✓	✓	✓	✓	✓	✓															
Connectors																						
Number of Scart connectors	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Audio out cinch rear	✓	✓	✓	✓	✓	✓	✓							✓	✓	✓	✓	✓	✓			✓
Audio/Video in cinch front	✓	✓	✓	✓	✓	✓	✓										✓	✓	✓			

	VR627/02	VR627/16	VR670B/02	VR670B/07	VR670B/16	VR670B/39	VR670B/58	VR670W/02	VR670W/07	VR670W/16	VR670W/39	VR670W/58	VR720/02	VR720/07	VR720/16	VR720/39	VR720/58	VR870CC/02	VR870CC/07	VR870CC/16
General																				
Auto Standby On/Off	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Backup Presets 1yr	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Backup Clock / Timer 3hrs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Events / month	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Low Power Standby Power Cons. [Watts]	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
Tuning - presets (only channel input)	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
Systems																				
Hyperband, UHF, VHF	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mono	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
German Stereo	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
NICAM		✓		✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓	✓		✓	✓
Splitter						✓					✓					✓				
Auto Seek				✓					✓					✓					✓	
Mechanism																				
Number of Video Heads	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
FM audio heads for stereo	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Head Cleaning Mode/automatic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Winding Time (E180) sec	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Rewind Time (E180) sec	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Quick View	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tape Counter lin. Relative (h.m.s.)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tape Counter Time Left (h.m)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
VISS: next/prev. index / blank tape search	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Features																				
Plug & Play	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
On Screen Display (OSD)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Welcome Screen	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Auto Install/Search/Store/Tuning	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Easy link / NexTView Link (P50)																		✓	✓	✓
Follow TV (analog)	✓	✓											✓	✓	✓	✓	✓	✓	✓	✓
Direct Record	✓	✓											✓	✓	✓	✓	✓	✓	✓	✓
16:9 (pin 8)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Digital Studio Picture Control	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Commercial Skip	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Turbo Timer	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Daily/Weekly	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Showview / VideoPlus+	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ShowView Mapping	✓	✓											✓	✓	✓	✓	✓	✓	✓	✓
VPS + PDC (VPD)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PDC (Time/Date) download	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Net-name detection	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Record Link / Scart 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sat control via mouse													✓	✓		✓				
Child Lock	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
VCR1/VCR2	✓	✓											✓	✓	✓	✓	✓	✓	✓	✓
OTR	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Long Play	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Auto LP	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tape List	✓	✓											✓	✓	✓	✓	✓			
SMART Picture	✓	✓											✓	✓	✓	✓	✓	✓	✓	✓
Connectors																				
Number of Scart connectors	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Audio out cinch rear	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Audio/Video in cinch front	✓	✓											✓	✓	✓	✓	✓	✓	✓	✓

1.3 Technical specification

Mains voltage	: 220 - 240 V, +/- 10%
Mains frequency	: 45 - 65 Hz
Power consumption	: mono 12.5 W during operation
	: HiFi 16 W during operation
without Low Power Standby	: mono 4 W during standby
	: HiFi 4.4 W during standby
with Low Power Standby	: < 4 W standby
Ambient temperature	: +10°C to +35°C
Relative humidity	: 20 - 80 %
Dimensions	: 380 x 260 x 94 mm
Weight	: 3,7 kg
Fast forward/rewind time (turbo)	: typ. 100s (E180 cass.)
Position of use	: horizontally, max. 15°
Video resolution	: ≥240 lines
Audio SP: Linear Audio	: 80Hz - 10kHz (±6 dB)
Audio LP: Linear Audio	: 80Hz - 5kHz (±6 dB)
Stereo FM Audio	: 20Hz - 20kHz (±3dB)

Euroconnector (AV1) SCART plug 1

Connection to TV, monitor, projection TV ...

Pin 1	ARO (audio right out)	500 mV_{rms} +/- 3 dB	R_{out}	1 kOhm
Pin 2	ARI (audio right in)	0,2 V_{rms} to 2V_{rms}	R_{in}	10 kOhm
Pin 3	ALO (audio left out)	500 mV_{rms} +/- 3 dB	R_{out}	1 kOhm
Pin 6	ALI (audio left in)	0,2 V_{rms} to 2 V_{rms}	R_{in}	10 kOhm
Pin 7	Blue (out) **)			
Pin 8	Switching output:	(with R_{load} = 10kOhm, C_{load}<2nF) low: 2 V high: 9.5 V rise time: 5 ms		
Pin 11	Green (out) **)			
Pin 15	Red (out) **)			
Pin 16	Blanking (out) **)	loop through enabled during standby, view-mode		
Pin 19	CVBS II (video out)	1 V_{pp} +1/-2dB	R_{out}	75 Ohm
Pin 20	CVBS I (video in)	1 V_{pp} +3/-3dB	R_{in}	75 Ohm

**) passive loop through from AV2

Euroconnector (AV2) SCART plug 2

Connection to decoder, SAT tuner, video disc, 2nd VCR ...

Pin 1	ARO (audio right out)	500 mV_{rms} +/- 3 dB	R_{out}	1 kOhm
Pin 2	ARI (audio right in)	0,2 V_{rms} to 2V_{rms}	R_{in}	10 kOhm
Pin 3	ALO (audio left out)	500 mV_{rms} +/- 3 dB	R_{out}	1 kOhm
Pin 6	ALI (audio left in)	0,2 V_{rms} to 2 V_{rms}	R_{in}	10 kOhm
Pin 7	Blue (out) **)			
Pin 8	Switching input only:	low: 2 V (low)	R_{in}	10 kOhm
		high: 4.5 V (high)	R_{in}	10 kOhm
Pin 11	Green (in) *)			
Pin 15	Red (in) *)			
Pin 16	Blanking (in) *)	loop through enabled during standby, view-mode		
Pin 19	CVBS II (video out)	1 V_{pp} +1/-2dB	R_{out}	75 Ohm
Pin 20	CVBS I (video in)	1 V_{pp} +3/-3dB	R_{in}	75 Ohm

*) passive loop through to Euroconnector AV1

Cinch Audio/Video input on front panel (OPTION)

Audio:

AINFR (audio right in) red	0.2 V_{rms} to 2 V_{rms}	typ. 500 mV_{rms}
AINFL (audio left in) white	0.2 V_{rms} to 2 V_{rms}	typ. 500 mV_{rms}
Input impedance	47 kOhm	

Video:

VFR yellow	1 Vpp + 3 / -3 dB
Input impedance	75 Ohm

Cinch Audio Out Rear (OPTION)

AOUT1R (audio right out) red	500 mV_{rms} +/- 3 dB R_{out} 1 kOhm
AOUT1L (audio left out) white	500 mV_{rms} +/- 3 dB R_{out} 1 kOhm

This outputs are in parallel with the corresponding outputs on Euroconnector 1.

TUMOD

Modulator:

Frequency range loop through		45 MHz - 860 MHz
Gain:	ANT IN - TV OUT	2 dB + 3 / -2 dB
	ANT IN - TUN OUT	2 dB + 3 / -2 dB
Switch for RF input attenuation		NO
Frequency range out (tuned by IIC bus)		Ch 21 - Ch55

Tuner:

Frequency range		43 MHz - 860 MHz
	for UK	450 MHz - 860MHz
Input voltage	max.	< 100 dBμV
	min.	> 60 dBμV

2. Safety instructions, Modifications

2.1 Safety instructions

- Safety regulations demand that the set be restored to its original condition and that components identical with the original types be used.
- Safety components are marked by the symbol ⚠
- All ICs and many other semi-conductors are susceptible to electrostatic discharges (ESD). Careless handling during repair may reduce life drastically. When repairing, make sure that you are conneted with the same potential as the mass of the set via a wrist wrap with resistance. Keep components and tools on the same potential.
- A set to be repaired should always be connected to the mains via a suitable isolating transformer.
- Never replace any modules or any other parts while the set is switched on.
- Use plastic instead of metal alignment tools. This in order to prelude short-circuit or to prevent a specific circuit from being rendered unstable.

2.1.1 Remarks

- The direct voltages and oscillograms ought to be measured relative to the set mass.
- The direct voltages and oscillograms mentioned in the diagrams ought to be measured with a colour bar signal and the picture carrier at 503.25 MHz (C25).
- The oscillograms and direct voltages have been measured in RECORD or PLAY mode.
- The semiconductors, which are mentioned in the circuit diagram and in the parts lists, are fully exchangeable per position with the semiconductors in the set, irrespective of the type designation of these semiconductors.

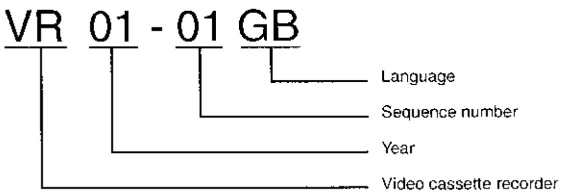
Engineer's remarks:

2.2 Modifications

2.2.1 Updating the service manual

All modifications and/or supplements to the Service Manual are published by means of Service Information bulletins.

Each Service Information is numbered:


VR 01 - 01 GB
Language
Sequence number
Year
Video cassette recorder

A Service Information bulletin consists of a front page which, if needed, is followed by supplementary and/or replacement sheets.

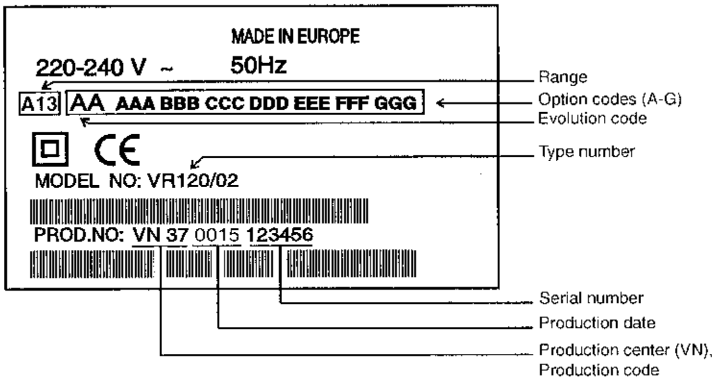
Replacement sheets should replace existing sheets in the Service Manual. These sheets are identified by an additional letter after the page number.
Example: Page 5-1a replaces page 5-1 in the Service Manual.

Supplementary sheets should be inserted between existing sheets in the Service Manual. These sheets are identified by an additional figure after the page number.
Example: Page 5-1-1 should be inserted after page 5-1.

2.2.2 Modifications in the set

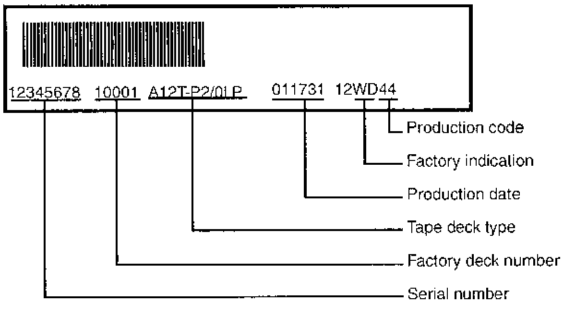
All important parts of the set (such as the tape deck, the printed circuits and modules) are equiped with a sticker. Those stickers provide a number of important information.

Type plate
The type plate is located on the back cover.


MADE IN EUROPE
220-240 V ~ 50Hz
A13 AA AAA BBB CCC DDD EEE FFF GGG
CE
MODEL NO: VR120/02
PROD.NO: VN 37 0015 123456
Range
Option codes (A-G)
Evolution code
Type number
Serial number
Production date
Production center (VN),
Production code

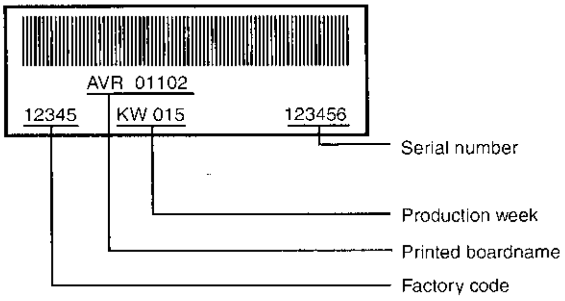
Note:
- In case of an important change in the set, the production code on the type plate is incremented: E.g. 37 becomes 38.
- In case of a major change in the set, the evolution code is incremented: E.g. AA becomes AB.

Tape deck


12345678 10001 A12T-P2/01LP 011731 12WD44
Production code
Factory indication
Production date
Tape deck type
Factory deck number
Serial number

Note:
- The production code and the serial number on the tape deck do not correspond to the production code and the serial number on the type plate.

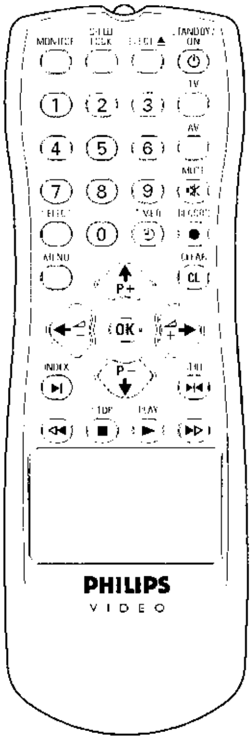
Printed circuits
The sticker is generally located on the copper side of the board.
Example:


AVR 01102
12345
KW 015
123456
Serial number
Production week
Printed boardname
Factory code

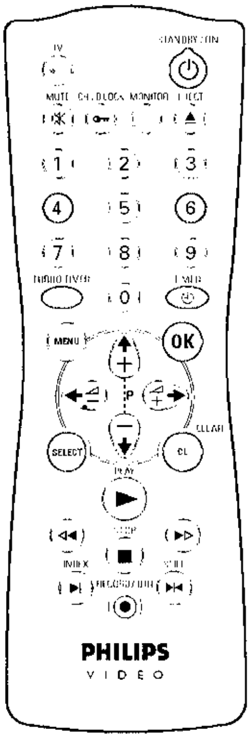
Note:
- The production code number might not always be mentioned.

In case of an important modification, the last figure of the factory code number (point number) is increased by one: E.g. 8502.1 becomes 8502.2

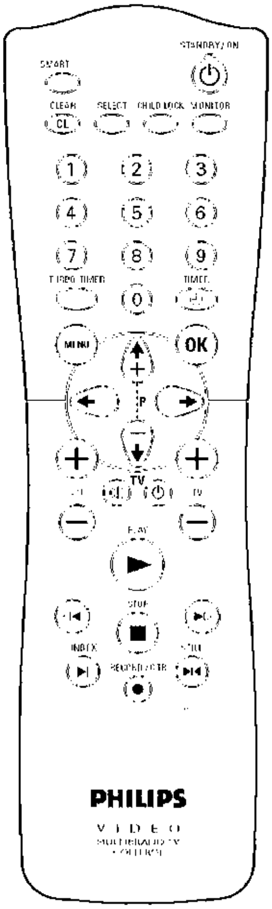
3. Direction for use


MONITOR
CHILD LOCK
EJECT ▲
STANDBY/ON
TV
AV
MUTE
TIMER
RECORD
MENU
CLEAR
CL
P+
OK
P–
INDEX
STILL
STOP
PLAY
PHILIPS
VIDEO

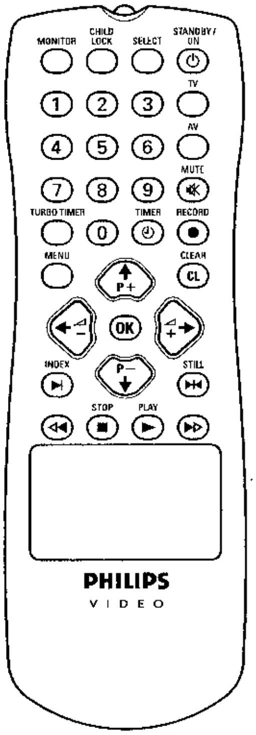
RT111
RT116


TV
STANDBY/ON
MUTE
CHILD LOCK
MONITOR
EJECT
TURBO TIMER
TIMER
MENU
OK
P
SELECT
CL
CLEAR
PLAY
STOP
INDEX
RECORD/OTR
STILL
PHILIPS
VIDEO

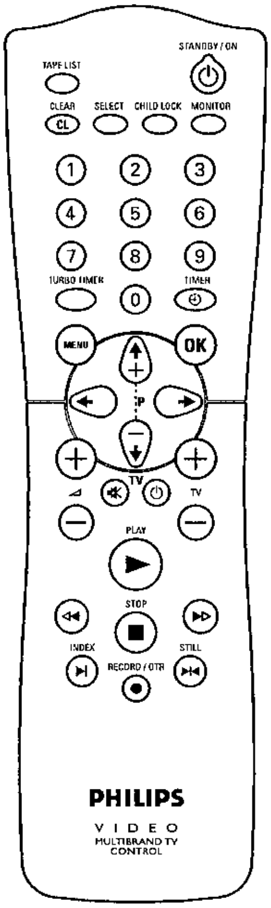
RT112


SMART
STANDBY/ON
CLEAR
CL
SELECT
CHILD LOCK
MONITOR
TURBO TIMER
TIMER
MENU
OK
P
TV
PLAY
STOP
INDEX
RECORD/OTR
STILL
PHILIPS
VIDEO
MULTIBRAND TV CONTROL

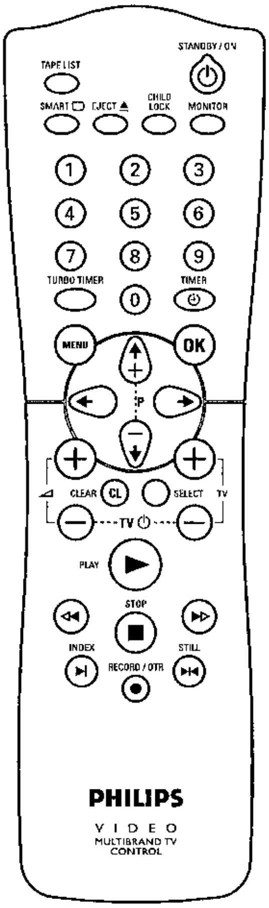
RT114


MONITOR
CHILD LOCK
SELECT
STANDBY/ON
TV
AV
MUTE
TURBO TIMER
TIMER
RECORD
MENU
CLEAR
CL
P+
OK
P–
INDEX
STILL
STOP
PLAY
PHILIPS
VIDEO

RT121


TAPE LIST
STANDBY/ON
CLEAR
CL
SELECT
CHILD LOCK
MONITOR
TURBO TIMER
TIMER
MENU
OK
P
TV
TV
PLAY
STOP
INDEX
RECORD/OTR
STILL
PHILIPS
VIDEO
MULTIBRAND TV CONTROL

RT123


TAPE LIST
STANDBY/ON
SMART
EJECT ▲
CHILD LOCK
MONITOR
TURBO TIMER
TIMER
MENU
OK
P
CLEAR
CL
SELECT
TV
TV
PLAY
STOP
INDEX
RECORD/OTR
STILL
PHILIPS
VIDEO
MULTIBRAND TV CONTROL

RT128

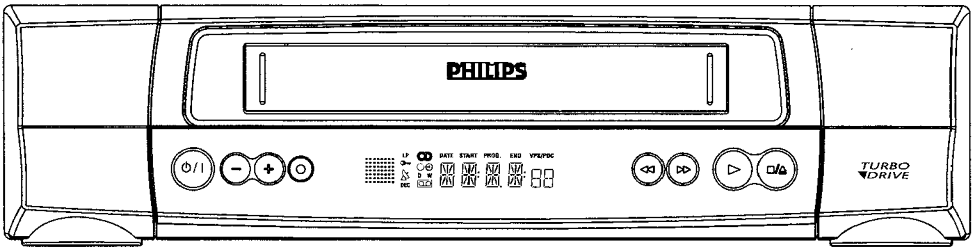
Remote control

SMART	**SMART**: To adjust the picture setting during playback
STANDBY/ON ⏻	**Switch off** : To switch off set, interrupt menu function, interrupt a programmed recording (TIMER)
CLEAR (CL)	**Delete** : To delete last entry/Clear programmed recording (TIMER)
SELECT	**Select**: To select a function
CHILD LOCK	**Child Lock** : To switch child lock on/off
MONITOR	**TV monitor** : To switch between TV reception and VCR playback
0-9	**Number buttons**: 0 - 9
TURBO TIMER	**TurboTimer**Aufnahmen programmieren mit der Funktion TurboTimer
TIMER ⏲	**TIMER**: To make a manual TIMER programming or to alter or clear a programmed TIMER
MENU	**Menu** : To call up or end main menu
OK	**Store/Confirm**: To store or confirm entry
←	**Select**: Cursor left
→	**Select**: Cursor right
↑→+	**Select**: To select a programme number
–→↓	**Select**: To select a programme number
PLAY ►	**Playback** : To play a recorded cassette
◁◀	**Rewind** : During STOP and STANDBY: rewind, during PLAYBACK: reverse scanning
STOP ■	**Pause/Stop**: To stop the tape, except while a TIMER-recording is being made
▶▷	**Forward wind**: During STOP and STANDBY: forward wind, during PLAYBACK: forward scanning
INDEX ▶I	**Index search**: In combination with ◁◀/▶▷: to search for previous or next recording on the cassette.
RECORD ●	**Record**: To record the programme selected
STILL ▶I◀	**Still picture** : To stop the tape and show a still picture

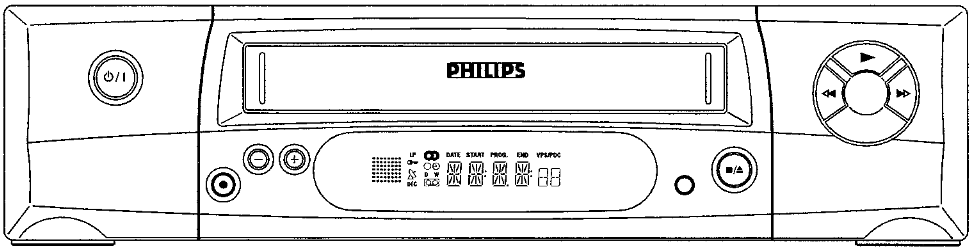
Additional TV functions

⊿+	**TV volume**: TV volume up
⊿–	**TV volume**: TV volume down
TV 🔇	**TV sound off** : To switch the sound on or off
TV ⏻	**Switch off** : To switch off the TV
TV +	**TV Programme number**: TV programme number up
TV –	**TV Programme number**: TV programme number down

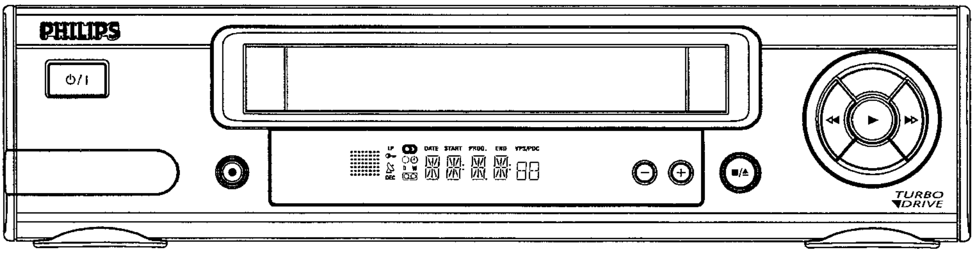
Set width 380 mm


PHILIPS
TURBO DRIVE

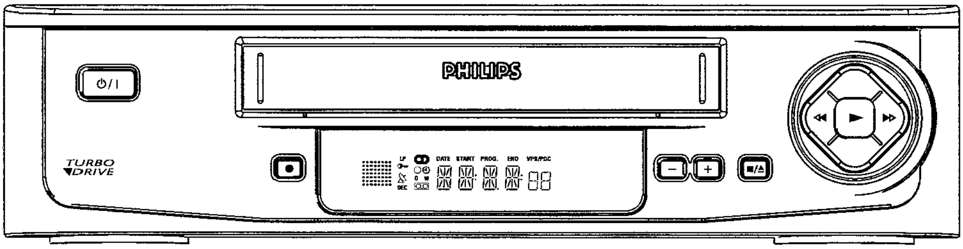
VR120
VR402
VR520



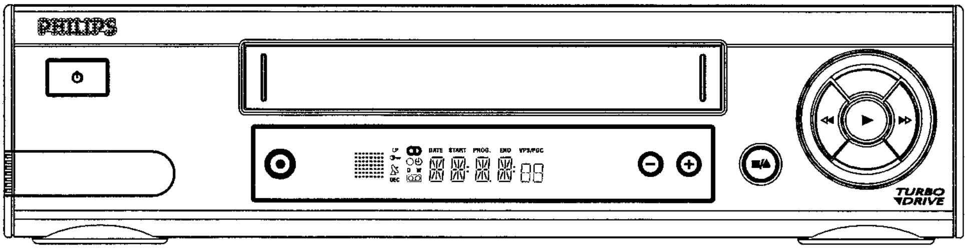
VR170
VR570
VR572


PHILIPS
TURBO DRIVE

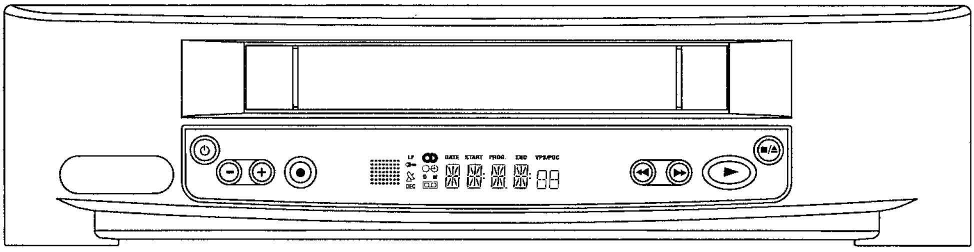
VR220
VR420


PHILIPS
TURBO DRIVE

VR270B
VR270W
VR670B
VR670W

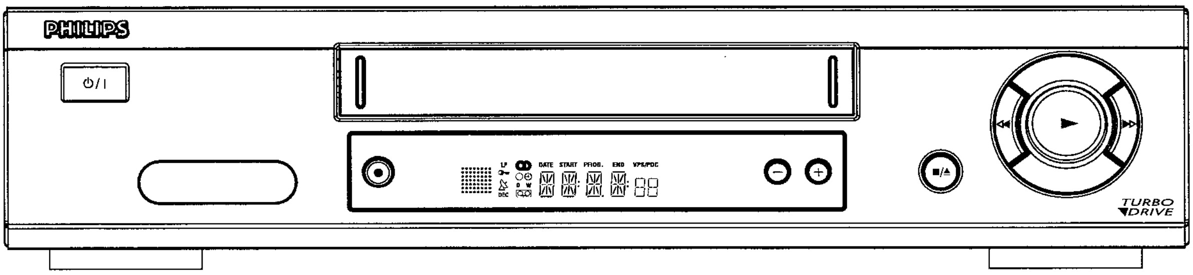

PHILIPS
TURBO DRIVE

VR620
VR622
VR627

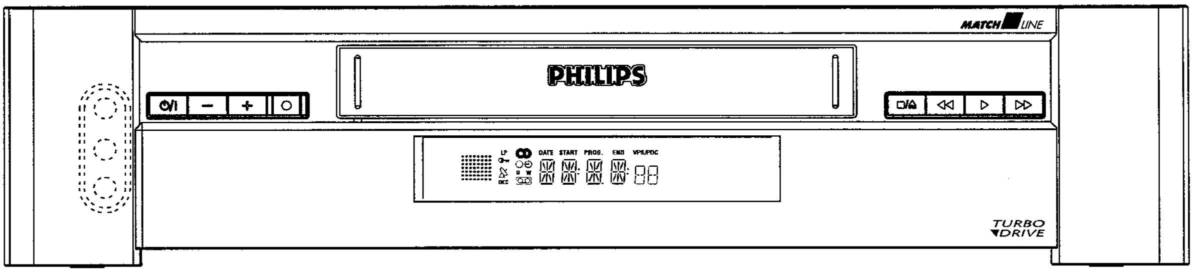


SB140
SB145
SB445
SB645
SB745
20DV30
45DV30
65DV30

Set width 435 mm


PHILIPS
⏻/I
DATE
START
PROG.
END
VPS/PDC
TURBO DRIVE

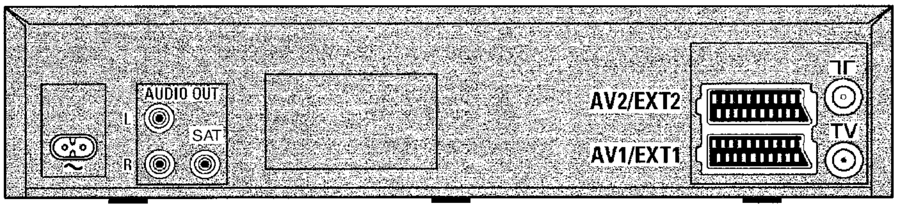
VR720


MATCH LINE
PHILIPS
⏻/I
−
+
DATE
START
PROG.
END
VPS/PDC
TURBO DRIVE

VR870L
VR870CC

STANDBY ⏻	**Standby** : To switch off or on, interrupt a function, interrupt a programmed recording (TIMER)
RECORD ●	**Record**: To record the programme selected
AUDIO	**Audio input socket left/right** : To connect a camera recorder or video recorder (programme number 'E3')
VIDEO	**Video input socket** : To connect a camera recorder or video recorder ('E3')
PROGRAMME−	**Select**: One line or programme number down.
PROGRAMME+	**Select**: One line or programme number up.
◁◀	**Rewind** : During STOP and STANDBY: rewind, during PLAYBACK: reverse scanning
PLAY ▶	**Playback** : To play a cassette
▶▷	**Forward wind**: During STOP and STANDBY: forward wind, during PLAYBACK: forward scanning
STOP/EJECT ■/▲	**Pause/Stop, eject cassette:** To stop the tape and eject the cassette

Back of the set


AUDIO OUT
L
R
SAT
AV2/EXT2
AV1/EXT1
TV

∼	**Mains socket**: To connect the mains cable
IR-SAT	**Satmouse socket**: To connect a satmouse.
AV2 EXT2	**Scart socket 2**: To connect a satellite receiver, decoder, video recorder, etc. (programme number 'E2')
AV1 EXT1	**Scart socket 1**: To connect the TV set (programme number 'E 1')
⫪	**Aerial input socket**: To connect the aerial cable
TV	**Aerial output socket**: To connect the TV set

1 Introduction

Special functions of your new video recorder

Your PHILIPS video recorder is not just for recording and playing back VHS cassettes. It also has a whole range of special functions which will make the day-to-day use of your new video recorder much easier.

DIGITAL STUDIO PICTURE CONTROL	Philips has developed a system which produces the best possible playback quality. For old and often used video cassettes, this system reduces interference. For new or high quality cassettes, it emphasises the details.
SMART PICTURE	This function allows you to save the playback settings that suit you best. Select your own personal settings for this type of film you are currently watching.
Plug and Play	When you connect your video recorder to your television and plug it into the wall socket, you will be welcomed with a screen menu. All you have to do is follow the instructions in the 'intelligent help line' for the next step. Enjoy the automatic TV channel search/save function and the automatic time setting.
Multibrand TV control	You can operate the main functions on your television using your video recorder remote control, even if your television is not a Philips.
Follow TV	This function automatically transfers all the television channel settings onto your video recorder.
Record Link	Recordings made on your video recorder can be controlled by an external satellite receiver.
Direct Record	Your video recorder can ascertain which channel is currently playing on your television and record from it at the touch of a button.
TURBO DRIVE	The precision tape drive from Philips provides short rewind times and automatic tape length recognition.

SHOWVIEW®

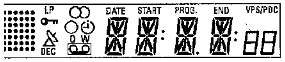
Simple programming system for video recorders. Makes programming as easy as making a telephone call. Simply enter the number code associated with your television programme. This number is located in your favourite television listings magazine.

ShowView is a registered trademark of Gemstar Development Corporation. The ShowView system is manufactured under licence from Gemstar Development Corporation.

So that you can identify your machine for service questions or in the event of theft, enter the serial number here. The serial number (PROD.NO.) is printed on the type plate fixed at the back of the device.

MODEL NO. VR720/58 PHILIPS
PROD. NO. ....

The symbols on your video recorder display

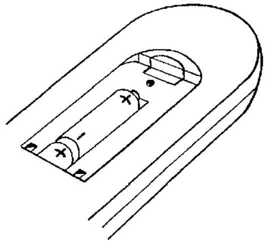


These symbols can light up on your video recorder display:

▦	This is where the current operating mode is shown as a symbol.
LP	When you have switched on the LP (Long Play) function or when you play a tape that has been recorded in LP (Long Play).
O┳	When you have switched on the child lock.
📡	When a satellite recording has been programmed.
DEC	When a decoder has been allocated to the TV channel (currently selected programme number on the video recorder) you have currently selected on the video recorder.
∞	When you play a cassette that has been recorded with hifi sound, or when a hifi sound is transmitted.
○	When you are making a recording.
⏻	When you have programmed a recording or when a programmed recording is being made.
D	When you are programming daily recordings.
W	When you are programming weekly recordings.
⊡	When you have put a cassette in the video recorder.
DATE	When the date of the programmed recording is shown.
START	When the start time of the programmed recording is shown.
PROG.	When the programme number of the programmed recording is shown.
END	When the end time of the programmed recording is shown.
VPS/PDC	Video Programming System / Programme Delivery Control: when a VPS or PDC code is being transmitted.
8888	Display of programme number of the TV channel / tape position / channel name / function.
88	Tape position in seconds.

2 Connecting the video recorder

Preparing the remote control for operation



The remote control and its batteries are packed separately in the original video recorder packaging. You must install the batteries in the remote control before use - described in the following section.

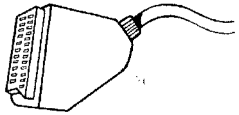
❶ Take the remote control and the enclosed batteries (2 batteries).

❷ Open the remote control's battery compartment and place the batteries in it as shown in the picture and close the battery compartment.

The remote control is now ready to use. Its range is approximately 5 meters.

Connecting your video recorder to the TV set

The necessary cable connections must be made before you can record or playback TV programmes using your video recorder.
We recommend that you use a scart cable to connect your TV set and video recorder.



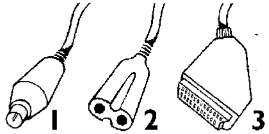
What is a scart cable?
The scart or Euro AV cable serves as the universal connector for picture, sound and control signals. With this type of connection, there is practically no loss of quality during the picture or sound transfer.

When you install your video recorder for the first time, select one of the following options:

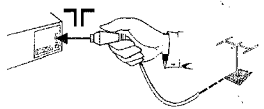
'Connecting with a scart cable'
If your TV set has a scart socket and you are using a scart cable.

'Connecting without a scart cable'
If you do **not** wish to use a scart cable.

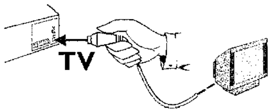
Connecting with a scart cable



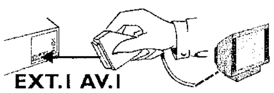
Have the following cables ready:
an aerial cable (1, supplied), a mains cable (2, supplied), a scart cable (3).



❶ Remove the aerial cable plug from your TV set. Insert it into the socket **⅂⅃** at the back of the video recorder.



❷ Insert one end of the supplied aerial cable into the socket 📺 at the back of the video recorder and the other end into the aerial input socket at the back of the TV set.

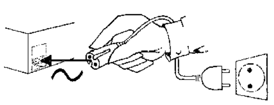


❸ Plug one end of a scart cable into the scart socket **EXT.1 AV 1** at the back of the video recorder and the other end into the suitable scart socket on your TV set (see your TV's operating instructions).

My TV set has several scart sockets. Which one should I use?
Select that scart socket which is suited for the video output as well as for the video input.

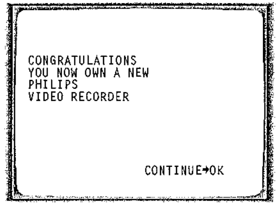
My TV offers me a selection menu for the scart socket.
Select 'TV' as a connection source of this scart socket.

❹ Switch on the TV set.



❺ Insert one end of the supplied mains cable into the mains socket ∿ at the back of the video recorder and the other end into the wall socket.

❻ If the connection was properly made and your TV was **automatically switched** to the programme number for the scart socket, e.g. 'EXT', '0', 'AV', you will see the following picture:



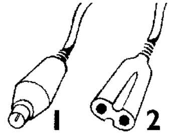
CONGRATULATIONS
YOU NOW OWN A NEW
PHILIPS
VIDEO RECORDER

CONTINUE➜OK

×My screen is empty
- ✓ Many TV sets are switched to the programme number for the scart socket by way of a control signal sent through the scart cable.
- ✓ If the TV set does not automatically switch to the scart socket programme number, manually change to the corresponding programme number on your TV set (see your TV's operating instructions).

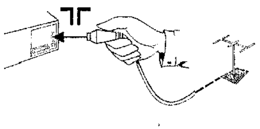
Then, read the paragraph 'Initial installation' in the chapter 'Installing your video recorder'.

Connecting without a scart cable

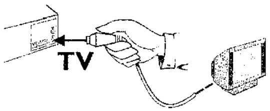


Have the following cables ready:
an aerial cable (1, supplied), a mains cable (2, supplied).

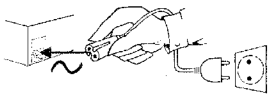
❶ Switch off your TV set.



❷ Remove the aerial cable plug from the aerial input socket of the TV set. Insert it into the socket **⅂⅃** at the back of the video recorder.



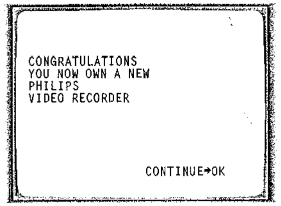
❸ Insert one end of the supplied aerial cable into the socket 📺 at the back of the video recorder and the other end into the aerial input socket at the back of the TV set.



❹ Insert one end of the supplied mains cable into the mains socket ∿ at the back of the video recorder and the other end into the wall socket.

❺ Switch on your TV set and select the programme number used for video playback on your TV set (see your TV's operating instructions).

Which programme number is used for video recorder operation?
To ensure the stability of the television picture during cassette playback (prevention of waves or streaks), special programme numbers have been set aside on the TV for the use of video recorders. This is usually the highest possible programme number, e.g. '12', '16', '99' or even programme number '0'. For more information, please see your TV's operating instructions.



```
CONGRATULATIONS
YOU NOW OWN A NEW
PHILIPS
VIDEO RECORDER

                 CONTINUE→OK
```

⑥ Select this programme number and manually start the TV's channel search as if you wanted to save a new TV channel until the 'test image' appears.

× I do not see a 'test screen'
- ✓ Check the cable connections.
- ✓ The video recorder 'transmits' on the 591MHz frequency (channel 36) Repeat the channel search on your TV set.

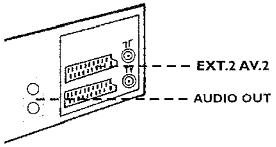
⑦ Save this programme number setting on your TV set for video recorder operation.

Programme number for video recorder operation
You have now saved a programme number for use by your video recorder as you would a regular TV channel. This programme number must now be used in future for video recorder playback ('video recorder' TV channel).

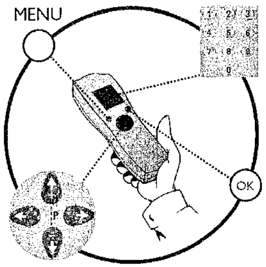
You can find more details in chapter 'Initial Installation'.

Connecting additional devices

You can connect additional devices such as decoders, satellite receivers, camcorders, etc. to the socket **EXT.2 AV 2**.
Two audio sockets **AUDO OUT L R** are located on the back of the video recorder (audio signal output left/right). These can be used to connect stereo systems.



3 Installing your video recording



Initial installation

This chapter shows you how to start the initial installation. The video recorder automatically seeks out and stores all available TV channels.

'Aim' correctly
In the following sections, you require the remote control for the first time. When using, always aim the front of the remote control at the video recorder and not at the TV set.

Connecting additional devices
After you have connected additional devices (satellite receiver, etc.) through the aerial cable, switch them on. The automatic channel search will recognise them and save them.

❶ Confirm the image on the TV screen by pressing the **OK** button on the remote control.

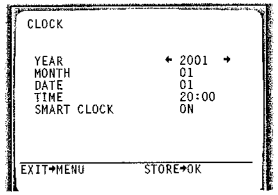
❷ Select the desired language for the on-screen menu by pressing **P –↓** or **↑+ P**.

What is an on-screen menu?
The multi-language on-screen menu takes the mystery out of using your new video recorder. All settings and/or functions are displayed on your TV screen in the corresponding language.

❸ Confirm with **OK**.

❹ Select the country of your residence with **P –↓** or **↑+ P**.
If your country does not appear, select 'OTHERS'.
Confirm with **OK**.

× The video recorder does not find any TV channels during the search
- ✓ Select channel 1 on the TV set. Can you see the saved TV channel on the TV set?
  If not, check the cable connection of the aerial (aerial socket), video recorder, TV set.
- ✓ Please have patience.
  The video recorder searches the entire frequency range in order to find and save the largest possible number of TV channels. It is possible that the TV channels in your country are broadcast in a higher frequency range. As soon as this range is reached during the search, the video recorder will find the TV channels.



```
CLOCK

YEAR            ← 2001 →
MONTH             01
DATE              01
TIME              20:00
SMART CLOCK       ON

EXIT→MENU       STORE→OK
```

❺ When the automatic TV channel search is complete, 'STORED' will briefly appear on the TV screen.
'YEAR', 'MONTH', 'DATE', 'TIME' will appear on the TV screen.

❻ Check the year in line 'YEAR'. If required, please change the year with the number buttons **0-9** on the remote control.

7. Select the next line with ↑+P or P−↓ .

8. Check if the displayed settings for 'MONTH', 'DATE' and 'TIME' are correct.

9. When all information is correct, save by pressing OK. 'STORED' will briefly flash in the video recorder display.

The initial installation is now complete.

Satellite receiver
If you are connecting a satellite receiver, please read the section 'Using the satellite receiver'.

Decoder
If you are connecting a decoder, you must install it as described in the next section.

× **Sound disruptions can occur on several TV channels**

✓ If sound disruptions should occur for several saved TV channels or there is no sound at all, it is possible that the incorrect TV system was saved for this TV channel. In the chapter 'Manual TV channel search' you will find the information on how to change the TV system.

Decoder allocation

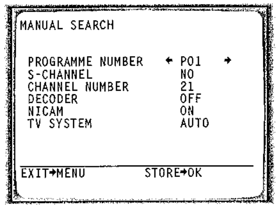
Some TV channels transmit encoded TV signals which can only be viewed with a commercially purchased or hired decoder without disturbances. You can connect such a decoder (descrambler) to this video recorder. The following function will automatically activate the connected decoder for the desired TV channel.

1. Switch the TV on. If applicable, select the programme number for the video recorder operation.

2. Use the buttons ↑+P, P−↓ on the video recorder or the number buttons **0-9** on the remote control to select the TV channel which you would like to allocate the decoder to.

3. Press the button **MENU** on the remote control. The main menu will appear.

4. Use the buttons ↑+P or P−↓ to select the line 'MANUAL SEARCH' and confirm with **OK**.



```
MANUAL SEARCH

PROGRAMME NUMBER   ← P01  →
S-CHANNEL            NO
CHANNEL NUMBER       21
DECODER              OFF
NICAM                ON
TV SYSTEM            AUTO

EXIT→MENU        STORE→OK
```

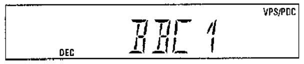
5. Use the buttons P−↓ or ↑+P to select the line 'DECODER'.

6. Use the buttons ← or → to select 'ON' (Decoder switched on).

How can I switch off the decoder?
Use the button → on the screen to select 'OFF' (Decoder switched off).

7. Confirm with **OK**.

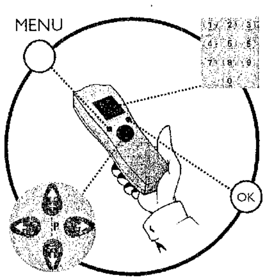
8. End with the button **MENU**.



The decoder has now been allocated to this TV channel.
If this TV channel is chosen, the symbol 'DEC' will appear in the video recorder display.

Manual TV channel search

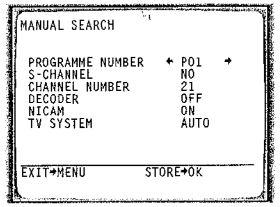
In some cases it could occur that all of the TV channels were not found and saved during the initial installation. In this case, the missing or coded TV channels must be searched for and stored manually.



1. Switch on the TV set. If required, select the programme number for the video recorder.

2. Press **MENU** on the remote control.
The main menu will appear.

3. Select line 'MANUAL SEARCH' using P−↓ or ↑+P and confirm with **OK**.



```
MANUAL SEARCH

PROGRAMME NUMBER   ← P01  →
S-CHANNEL            NO
CHANNEL NUMBER       21
DECODER              OFF
NICAM                ON
TV SYSTEM            AUTO

EXIT→MENU        STORE→OK
```

4. Select line 'PROGRAMME NUMBER' using P−↓ or ↑+P.

5. Using ← or →, select the desired programme number that you want to use for the TV channel, e.g. 'P01'.

6. In line 'S-CHANNEL', select the desired display using →.

What is hidden behind the settings?
'NO': Display/Entry of channels
'YES': Display/Entry of special channels

What is a special channel?
TV channels are transmitted in certain pre-defined frequency ranges. These ranges are divided into channels. A specific frequency/channel is assigned to each TV station. Certain frequency ranges are specified as special channels (hyperband channels).

❼ In line 'CHANNEL NUMBER', enter the channel of the desired TV station using the number buttons **0-9** .

× I don't know the channels for my TV stations
✓ In this case, press → in line 'CHANNEL NUMBER' to start the automatic channel search. A changing channel number will appear on the TV screen. Continue the automatic search until you have found the desired TV channel.

What is NICAM?
NICAM is a digital sound transmission system. Using NICAM, you can transmit either 1 stereo channel or 2 separate mono channels. However, if you experience poor reception resulting in sound disruptions, you can turn off NICAM.
In line 'NICAM', select 'OFF' using ← or → .

How can I change the TV transmission system of the TV channel?
In line 'TV SYSTEM', select the corresponding TV system using ← or → until the picture/sound disruptions are minimised.

❽ Save the TV channel with **OK** . 'STORED' will briefly appear on the TV screen.

❾ To search for other TV channels, begin again at step ❸ .

❿ To end, press **MENU** .

Using the satellite receiver

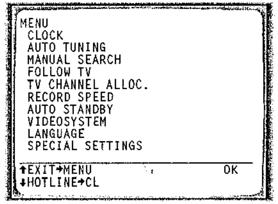
TV channels from a satellite receiver (connected to the scart socket **EXT.2 AV 2**) are received on the video recorder on programme number 'E2'.
To do this, select programme number 'E1' with **0** on the remote control and then select programme number 'E2' with **P−↓** .
You should select the TV channels to be received by the satellite receiver directly on the receiver itself.

Sorting TV channels automatically (Follow TV)

When the automatic channel search function is activated, the TV channels are saved in a specific order. This may vary from the order of TV channels on the TV set.
This function changes the order of TV channels saved in the video recorder to match that of the TV set.
This only works if the video recorder (socket **EXT.1 AV 1**) and the TV set **are connected with a scart cable**.

❶ Switch on the TV set. If required, select the programme number for the video recorder.

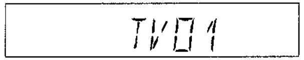
❷ Press the **MENU** button on the remote control. The main menu will appear.



```
MENU
 CLOCK
 AUTO TUNING
 MANUAL SEARCH
 FOLLOW TV
 TV CHANNEL ALLOC.
 RECORD SPEED
 AUTO STANDBY
 VIDEOSYSTEM
 LANGUAGE
 SPECIAL SETTINGS
↑EXIT→MENU              OK
↓HOTLINE→CL
```

❸ Select line 'FOLLOW TV' using **P−↓** or **↑+P** and confirm with **OK** .

❹ Press the **OK** button. 'TV01' will appear in the video recorder display.



TV01

❺ Select programme number '1' **on the TV set**.

× I cannot switch my TV set to programme number 'I'
✓ If you have connected additional devices to socket **EXT.2 AV 2**, please disconnect these devices. Because of other connected devices, the TV set could switch to the programme number of the scart socket.

❻ Confirm with **OK** on the video recorder remote control. The video recorder compares the TV channels on the TV set and the video recorder.
If the video recorder finds the same TV channel as on the TV set, then it stores it at 'P01'.

× 'NOTV' will appear in the display. The video recorder is not receiving a video signal from the TV set.
✓ Check the plug on the scart cable.
✓ Check your TV's operating instructions to see which scart socket is used for video signals.
✓ If this does not help, it's not possible to use this function.
Please read the section 'Sorting TV channels manually'.

❼ Wait until the next number, e.g. 'TV02' appears in the display.

❽ Select the next programme number **on the TV set**, e.g. '2'.

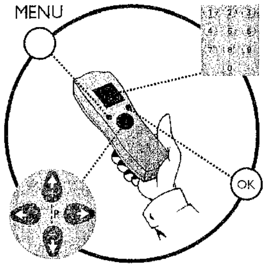
❾ Confirm with **OK** on the video recorder remote control.

Deleting sorting
You can delete an incorrect TV channel sorting by pressing **CLEAR (CL)**.

❿ Repeat steps ❼ to ❾ until you have assigned a programme number to all TV channels.

⓫ To end, press **MENU**.

Automatic TV channel search



During installation, all available TV channels are searched for and saved. If the channel assignments of your cable or satellite TV provider change or if you are reinstalling the video recorder, e.g. after moving house, you can start this procedure again. This will replace the TV channels already saved with the new ones.

❶ Switch on the TV set. If required, select the programme number for the video recorder.

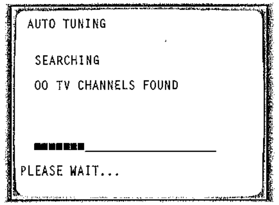
❷ Press the **MENU** button on the remote control. The main menu will appear.

❸ Select line 'AUTO TUNING' using **P–↓** or **↑+P**.

❹ Press **OK**.

❺ Select the country of your residence with **↑+P** or **P–↓**.
If your country doesn't appear, select 'OTHERS'.

❻ Press **OK**.



```
AUTO TUNING

 SEARCHING
 00 TV CHANNELS FOUND


PLEASE WAIT...
```

❼ The automatic TV channel search starts. This allows the video recorder to save all available TV channels. This procedure may take several minutes.

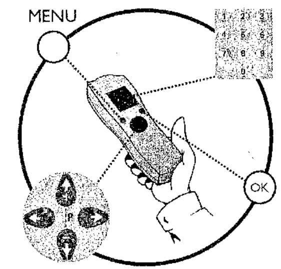
❽ When the TV channel search is complete, 'STORED' will briefly appear on the TV screen.

❾ To end, press **MENU**.

You can read about how to search for a TV channel manually in the section 'Manual TV channel search'.

Monitor function

You can switch back and forth between the TV picture and video recorder picture with **MONITOR**. But this only works when you use a scart cable to connect the video recorder to your TV set and your TV set responds to this switch-over.



Sorting and clearing TV channels manually

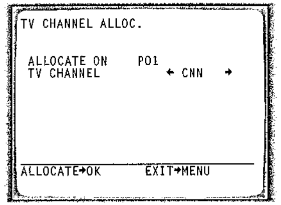
After you have performed the automatic channel search you may not agree with the sequence in which the individual TV channels have been allocated to the programme positions (programme numbers) of the video recorder. You can use this function to individually sort the TV channels already saved or to delete unwanted TV channels or those with poor reception.

❶ Switch on the TV set. If required, select the programme number for the video recorder.

❷ Press **MENU** on the remote control. The main menu will appear.

❸ Select line 'TV CHANNEL ALLOC.' using **P −↓** or **↑+ P**.

❹ Confirm with **OK**.



```
TV CHANNEL ALLOC.

 ALLOCATE ON    P01
 TV CHANNEL        ← CNN   →

ALLOCATE→OK       EXIT→MENU
```

❺ Using **←** or **→**, select the saved TV channel that you want to assign to the programme number 'P01'.

❻ Confirm with **OK**. The following message will briefly appear on the TV screen: 'ALLOCATED ON P01'.

❼ Then the sorting for the next highest programme number will appear on the screen, e.g. 'ALLOCATE ON P02'.

❽ Using **←** or **→**, select the saved TV channel that you want to assign to this programme number, e.g. 'P02'.

Deleting TV channels
Using **CLEAR (CL)** you can delete unwanted TV channels or those with poor reception.

❾ Confirm with **OK**. The following message will briefly appear on the TV screen: 'STORED'.

× The main menu will appear on the screen
✓ After you have confirmed the last channel that can be sorted, you will automatically return to the main menu since no more TV channels can be assigned.

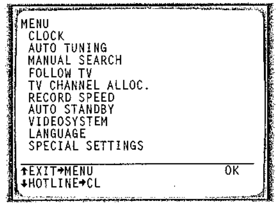
❿ To assign other TV channels to a programme number, repeat steps ❼ to ❾.

⓫ Confirm the assignment of the TV channel with **MENU**.

⓬ To exit the main menu, press **MENU**.

Setting on-screen menu language

You have the option of setting one of the displayed languages for the on-screen menu (OSD). However, the video recorder display will only display English text regardless of this setting.



```
MENU
 CLOCK
 AUTO TUNING
 MANUAL SEARCH
 FOLLOW TV
 TV CHANNEL ALLOC.
 RECORD SPEED
 AUTO STANDBY
 VIDEOSYSTEM
 LANGUAGE
 SPECIAL SETTINGS
↑EXIT→MENU                OK
↓HOTLINE→CL
```

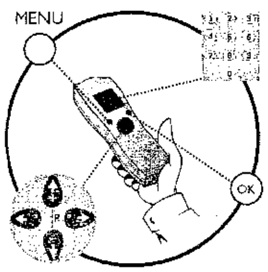
❶ Switch on the TV set. If required, select the programme number for the video recorder.

❷ Press **MENU** on the remote control. The main menu will appear.

❸ Select line 'LANGUAGE' and confirm with **OK**.

❹ Select the desired language with **P −↓** or **↑+ P** and confirm with **OK**.
'STORED' will appear briefly on the screen.

❺ To end, press **MENU**.

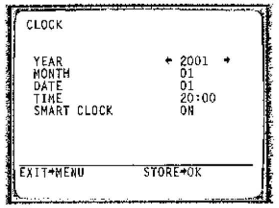


Setting the time and date

If the display shows an incorrect time or '--:--', the time and date must be reset manually.
If a TV channel which transmits TXT/PDC (teletext/PDC) is stored under programme number 'P01', time/date will automatically be taken from the TXT/PDC information. (SMART CLOCK)

❶ Switch on the TV set. If required, select the programme number for the video recorder.

❷ Press **MENU** on the remote control. The main menu will appear.



```
CLOCK

YEAR                  ← 2001  →
MONTH                   01
DATE                    01
TIME                    20:00
SMART CLOCK             ON

EXIT→MENU          STORE→OK
```

❸ Select line 'CLOCK' using **P –↓** or **↑+ P** and confirm with **OK**.

❹ Check the year in line 'YEAR'. If required, please change the year with the number buttons **0-9** on the remote control.

❺ Select the next line with **↑+ P** or **P –↓**.

❻ Check 'MONTH', 'DATE' and 'TIME' in the same way.

× **Time/date is displayed incorrectly despite manual setting**
✓ With Smart Clock, time/date is transferred from the TV channel saved on 'P01' and automatically corrected.
Switch off Smart Clock. In line 'SMART CLOCK', select 'OFF' using ← or →.
You can switch on 'SMART CLOCK' again when you select 'ON'.

❼ Check the displayed settings and confirm with **OK**.
'STORED' will appear briefly on the screen.

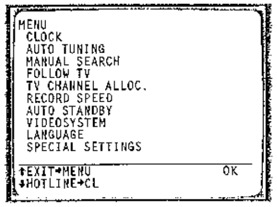
❽ To end, press **MENU**.

4 Important notes for operation

Switching on	You can switch on the video recorder with the **STANDBY/ON** ⏻ button, the number buttons **0-9** or by putting in a cassette.
Automatic switch-off	If the video recorder is not used for several minutes, it switches itself off automatically. This function can be deactivated (e.g. if you want to use the video recorder as a TV receiver). For more information, please read the section 'Automatic switch-off' in chapter 'Additional functions'.
Time in the display	If you have switched the video recorder off with **STANDBY/ON** ⏻, the time will show in the display, e.g. '18:00'. If the clock has not been set, '--:--' will appear. When the video recorder is switched off and the time isn't shown in the video recorder display, the clock display may be switched off. You will find more information in the chapter 'Additional functions' section 'Switch off the clock display'.
Energy consumption	The video recorder should always be connected to the mains so as not to affect the use of the TV or programmed recordings. Your video recorder uses less than 4W (with clock display switched off).
Power outage/no power	Channel information remains saved for up to 1 year, the time and timer information is saved for up to 3 hours.
Emergency exit	The video recorder and the remote control have the option of an 'Emergency exit'. You can use the **STANDBY/ON** ⏻ button to interrupt any function or step during use. You can operate your device without worry. There is no risk whatsoever of damaging the video recorder by performing user steps incorrectly.

Navigation in the screen menu

You can check/change many functions and settings of your video recorder via the screen menu. The individual functions are selected as follows:



```
MENU
 CLOCK
 AUTO TUNING
 MANUAL SEARCH
 FOLLOW TV
 TV CHANNEL ALLOC.
 RECORD SPEED
 AUTO STANDBY
 VIDEOSYSTEM
 LANGUAGE
 SPECIAL SETTINGS

↑EXIT→MENU                    OK
↓HOTLINE→CL
```

Call up the menu: with **MENU**.
To select: with **P –↓** or **↑+ P**.
To enter or change your selection: with the number buttons **0-9** or with ← or →.
To save or confirm: with **OK**.
To cancel: with **STANDBY/ON** ⏻.
To end: with **MENU**.

5 Tape List

General information

The 'Tape List is an integrated database in the video recorder that remembers all recordings made by this video recorder. The Tape List helps you keep track of which film is on which cassette. The 'Tape List' also gives you quick and easy access to recordings.
And: If desired, the video recorder will rewind to the beginning of the selected recording and automatically start playback.

Can I add cassettes that already have recordings on them to the Tape List?
Yes. Tape List can manage a maximum of 9 cassettes. However, there must be recordings on the cassettes in order to copy them to the Tape List database.

Adding a cassette to the Tape List

You can add any cassette to the 'Tape List'. Please note that the process for adding cassettes that already have recordings on them lasts longer than with new (blank) cassettes.

❶ Switch on the TV set. If required, select the programme number for the video recorder.

❷ Label the cassette to be inserted with a number from 1 to 9.

❸ Insert the cassette into the video recorder.

❹ 'TAPE' will appear in the display.

❺ Enter the cassette number using the **0-9** number buttons on the remote control.
The video recorder will briefly check the cassette inserted. 'CHECKING CASSETTE' appears on the TV screen.
If the cassette is new (blank), no information will appear on the screen.

× I see a cassette number and an overview of all recordings on this cassette
✓ You have selected a number which has already been included in the Tape Manager and contains a recording.

On the screen after 'CHECKING CASSETTE' I see the message "
There are already recordings on the cassette. This cassette is searched for recordings and added to the Tape List.

Why must I note the cassette number?
When searching for available recordings, you will need to insert the corresponding cassettes (cassette numbers).

How many cassettes can I save in the Tape List?
You can store up to 9 cassettes. You can store a maximum number of 50 titles in the Tape Manager.

Editing recording titles

In the Tape List, all recordings longer than 10 minutes are displayed with cassette number, recording title and length of recording. The TV channel, time and date are saved as a title. The title of this recording can only be changed after the recording has been completed.
To do this, the corresponding cassette does not have to be in the video recorder. In the following, you will read how to customise the titles to your wishes.

❶ Press **TAPE LIST** on the remote control. An overview of all saved titles/cassettes from the Tape List appears on the screen.

× I can see the message 'TAPE LIST- MEMORY EMPTY'
✓ There are no recordings saved in the Tape List. Therefore, it is not possible to add or change a title.

❷ Using **↑+P** or **P−↓** select the title to be edited and confirm with →.

❸ Using → or ← select the position where the letter/number/symbol is to be changed or re-entered.

❹ Change the desired symbol using **↑+P** or **P−↓**.

Deleting symbols
To delete a symbol of a recording title, press **CLEAR (CL)** at the corresponding symbol position.

❺ Repeat step ❸ and step ❹ until you have made the desired changes.

❻ Save the new title with **OK**.

❼ If you want to change more titles, repeat step ❸ through step ❼.

❽ To end, press **TAPE LIST**.

6 Playback

Searching for a title in the Tape List

This function can be used to quickly and easily find and play back a recording saved in the Tape List. The video recorder automatically rewinds to the beginning of the selected recording and automatically starts playback.

❶ Press **TAPE LIST** on the remote control.

❷ An overview of all recordings saved in Tape List appears on the screen.

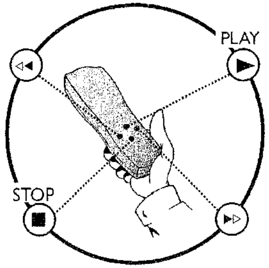
What do the displays on the screen mean?
'CASS.' = Cassette number
'TITLE' = Title (TV channel, time, date)
'LENGTH' = Length of the recording

❸ Select the title that you want to play back with **P –↓** or **↑+ P**.

× I see the message 'INSERT CASSETTE X' on the screen.
✓ The selected recording is located on the Tape List cassette with the displayed cassette number. Please insert the corresponding cassette. After a brief check, the video recorder will rewind to the beginning of the selected recording and start playback.

× I want to cancel the search
✓ If you want to cancel the search, press **MENU**.

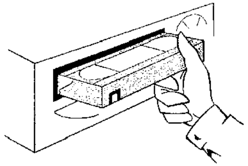
❹ Confirm with **OK**. The video recorder winds to the start of the selected recording and automatically starts playback.



Playing cassettes

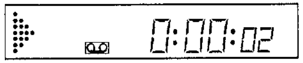
You can use this video recorder to play back recorded VHS video cassettes. You can operate the video recorder using the remote control or the buttons on the front of the video recorder.

What does VHS mean?
'Video Home System' (VHS) has become the world-wide standard for the playback and recording of amateur video cassettes. This popular standard continues to be improved. Super VHS (S-VHS) provides a sharper picture and less noise. Digital VHS (D-VHS) only works with digital picture and sound signals. Your video recorder can only record and play standard VHS cassettes.



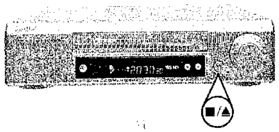
❶ Put a cassette into the cassette slot.
The cassette is inserted automatically. '📼 ' will appear on the display.

× I see 'TAPE' in the display
✓ The video recorder is waiting for you to enter a cassette number from the 'Tape List'. You can find more information on the Tape List in the chapter 'Tape List'.



❷ Press the Play button **PLAY ►** to view the tape.
This will, for example, appear in the display:

× Picture/ sound quality is poor
✓ When playing rental videos or older, poorer quality cassettes, it may not be possible to completely filter out picture and sound interference. This is not a fault in your machine.
Please read the section 'Selecting the picture settings (SMART PICTURE)', or the chapter 'Eliminating picture interference'.
✓ During playback the automatic TV system will switch-over automatically. If picture/sound interference occurs, attempt to fix the problem by manually switching the TV system. In that case, turn to chapter 'Additional functions' section 'Switching the video (color) system'.



❸ To stop the playback, press **STOP ■** on the remote control or **STOP/EJECT ■/▲** on the video recorder.

❹ To eject the cassette, press **STOP/EJECT ■/▲** on the video recorder when the video recorder stops the playback (STOP).
To eject a cassette, you can also use **EJECT ▲** on the remote control.

Automatic switch-off of special functions
Many functions (e.g. pause, still picture, search) switch themselves off automatically after a short time in order to protect the cassette and to save energy.

Do I need to change the playback speed when playing back LP recordings?
For playback, the correct recording speed 'SP' will automatically be selected. For more information, please read the section 'Selecting the recording speed (SP/LP)' in the chapter 'Manual recording'.

Playing back NTSC cassettes

Cassettes that have been recorded in the NTSC standard (for example, American cassettes) can be played back using this video recorder. However, this only works on PAL-television sets which are suitable for a picture frequency of 60Hz.
When you play an NTSC cassette '60HZ' will appear on the display.
Some special features (for example, still picture) are not possible while you are playing an NTSC cassette.

Displaying current tape position

The display shows the tape position in hours, minutes and seconds. In addition, by pressing **OK** you can show the present tape position on the TV screen.
The following information is displayed on the screen:
e.g.: 0:02:45 Shows the tape position in hours, minutes and seconds.
Moving/blinking arrow: This indicates the current tape position. The arrow moves in a line from left (tape start) to right (tape end).
'REMAIN 0:06': will show the actual amount of playing/recording time left on the tape in hours and minutes.
When you play an NTSC cassette, the video recorder will not show 'REMAIN 0:06'.

How can I set the counter to '0:00:00'?
You can set the counter to '0:00:00' using **CLEAR (CL)**.
When you put a cassette in the machine, the counter will automatically reset to 0:00:00'.

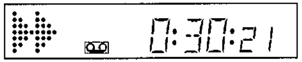
× **The counter does not move**
✓ This occurs when there are no recordings on a portion of a tape. Therefore, the video recorder cannot receive any information from the tape. This is not a fault in your machine.

× **The display/the screen shows '-0:01:20'**
✓ If you rewind a cassette from the tape position '0:00:00', the counter will show for instance, '-0:01:20' (the cassette will be rewound to 1 minute and 20 seconds before '0:00:00').

× **'-:--' is displayed in the 'REMAIN' counter**
✓ This counter will automatically recognise the length of the tape. In addition, when you put in a cassette the video recorder must first calculate the time played. Therefore, '-:--' appears first and only after the tape has been running for a few seconds will the correct playing time be shown.

Searching for a tape position with picture (scanning)

❶ While a cassette is playing, press ◁◀ (reverse) or ▶▷ (forward) one or more times. This will, for example, appear in the display:

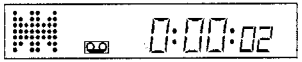


❷ To stop at a certain place on the tape, press **PLAY ▶** .

Decreased picture quality
Scanning interferes with the picture quality. The sound is switched off. This is not a fault in your machine.

Still picture / slow motion

❶ During playback, press **STILL ▶◀** to stop the tape and display a still picture. This will, for example, appear in the display:



❷ Each time you press **STILL ▶◀** , the picture will advance one frame.

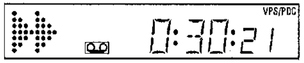
❸ When you hold down the **STILL ▶◀** button, the tape will be played in slow motion.

❹ When you press ▶▷ several times, you have a choice of several playback speeds for slow motion.

❺ To continue playback, press **PLAY ▶** .

Searching for tape position without picture (forward wind and rewind)

1. Stop the tape with **STOP ■** .



2. Press ◁◀ (reverse) or ▶▷ (forward). This will, for example, appear in the display:
3. To stop at a certain place on the tape, press **STOP ■** .

Instant View

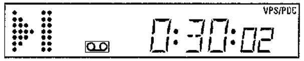
With this function you can switch to picture search during wind and rewind.

1. If you hold ◁◀ (rewind) or ▶▷ (wind) during wind or rewind, you will switch to picture search.
2. As soon as you release the button, the video recorder will automatically switch back to rewind or wind.

Automatic search for a tape position (index search)

Every time a tape is recorded an index marking is written on the tape. This marking can be compared with a bookmark. These marked positions can be found again quickly and easily later by pressing a button.

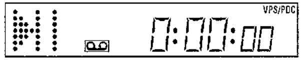
1. To search for the previous marking, press **INDEX ▶|** and then ◁◀ .



2. For the next marking, press **INDEX ▶|** and then ▶▷ . This will, for example, appear in the display for the next marking.
3. As soon as the video recorder finds this marking, it automatically switches to playback.

Automatic search for a blank space on the tape

You can search for space on the tape (at least 1 minute of blank tape) for a new recording, for example, after an existing recording on the tape.



1. Press **INDEX ▶|** . Then press **STOP ■** . This will, for example, appear in the display:
2. As soon as the video recorder finds the corresponding tape position, it automatically switches to pause.

× The cassette is ejected
✓ The video recorder was unable to find any blank space on the tape inserted.

Selecting picture settings (SMART PICTURE)

Using **SMART ▢** , you can display and set many stored picture settings for playback.

What types of picture settings are available to me?
'NATURAL': Natural picture (standard setting)
'DISTINCT': Emphasises details (quick movements, sports)
'SOFT': Suppression of interference (when using rental cassettes)
'SHARP': Increase in sharpness (e.g. for animated films)

1. During playback, press **SMART ▢** . This will show the current picture setting.
   Press the **SMART ▢** button several times to select the corresponding picture setting.
2. If the **SMART ▢** button is not been pressed after a few seconds, the selected picture setting will be saved.
3. These picture settings will not change until you eject the cassette.

7 Eliminating picture interference

Optimising tracking

This video recorder has an automatic tracking function. In order for the video heads to optimally read the video track of the newly inserted video cassette, the tape speed is slightly corrected automatically.
In some cases however, interference will still occur.
The following section will explain how to manually adjust the tracking settings.

❶ While a cassette is playing, hold **↑+P** until 'TRAC' (TRACking) appears in the display.

❷ Hold down the buttons **↑+P** or **P−↓** until the playback quality is at its best.

❸ Wait a few seconds, until 'TRAC' disappears from the display.

These selected picture settings will not change until you eject the cassette.

Optimising still picture

If the still picture vibrates vertically, you can improve the still picture as follows:

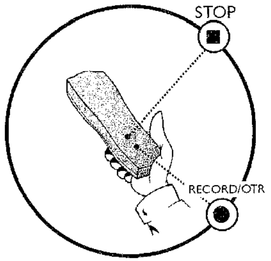
❶ During still picture, hold **↑+P** or **P−↓** until the picture quality is at its best.
'JITT' will appear in the display.

❷ When you release the button, 'JITT' will disappear.

The video recorder will store these settings automatically.

×I cannot reach optimal quality for the still picture
✓ Interference which cannot be alleviated by this function can occur in cassettes of poor quality or camcorder cassettes .

8 Manual recording



General information

Use 'Manual Recording' to make a spontaneous recording (for example, a programme currently being shown).

If you want to start and stop a recording manually, read the section **'Recording without automatic switch-off'**.

If you want to start a recording manually but have it stopped automatically, read the section **'Recording with automatic switch-off'**. (e.g. not to record to the end of the tape)

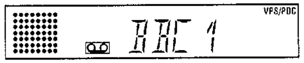
Read the section **'Direct record'** if you want to record a programme currently being shown.

Read the section **'Automatic recording from a satellite receiver'**, if you want a recording to be controlled automatically by a satellite receiver.

Recording without automatic switch-off

❶ Insert a cassette.

Using 'Tape List'
To save a recording in the 'Tape List' or to use a 'Tape List' cassette, enter the cassette number using the number buttons **0-9** on the remote control.
The cassette is being checked. You can find more information on the 'Tape List' in the chapter 'Tape List'.

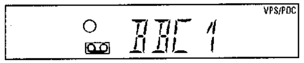


❷ Use **↑+P** or **P−↓** to select the programme number you want to record, for example, 'P01'. This will appear on the display:

Station name
If a TV station transmits a station name, it will be shown in the display.

Programme numbers 'E1' 'E2'
This programme number is provided for recording from external sources (via the scart socket **EXT.1 AV 1** , **EXT.2 AV 2**) .

Programme number 'E3'
This programme number is used for recording from the audio and video front sockets.



❸ To start recording, press **RECORD/OTR ●** on the remote control or **RECORD ●** on the video recorder. This will, for example, appear in the display:

Displaying tape position
Using **OK** you can show the tape position in the display.

❹ Stop recording with **STOP ■**.

Recording with automatic switch-off (OTR One-Touch-Recording)

❶ Insert a cassette.

Using 'Tape List'
To save a recording in the 'Tape List' or to use a 'Tape List' cassette, enter the cassette number using the number buttons **0-9** on the remote control. The cassette is being checked. You can find more information on the 'Tape List' in the chapter 'Tape List'.

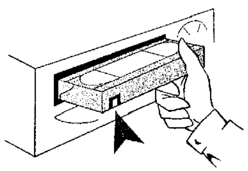
❷ Use **↑+P** or **P−↓** to select the programme number you want to record.

❸ Press **RECORD/OTR ●** on the remote control.

❹ Each time you press **RECORD/OTR ●** you will add 30 minutes to the recording time.

How can I clear the recording time just setted?
To delete an entry, press **CLEAR (CL)** while the display shows the recording time.

Preventing accidental erasing of cassettes



All cassettes (except for rental and store cassettes) have a security tab on the back of the cassette (see arrow).
To prevent recording over important recordings (erasing), you can remove this security tab or slide it to the left.
If you later decide to record on a protected cassette, simply cover the hole with adhesive tape or slide the tab to the right.

Lining up recordings (assemble cut)

When you add a further recording to a cassette, which already has a recording on it, a short blank (flicker) can appear between the old and the new recording or the picture itself can flicker.
To help reduce these from occurring, proceed as follows:

❶ Find the tape position of the old recording where you want to insert the new recording.

❷ Look at the last minute of the old recording (playback).

❸ Press **STOP ■** on the remote control at the tape position where the new recording is to go. **II** ' will appear on the display.

❹ Now start recording as usual by pressing **RECORD/OTR ●** on the remote control.

❺ Stop recording with **STOP ■**.

Selecting the recording speed (SP or LP)

You can reduce the recording speed by half. This makes it possible to record, for example, eight-hours instead of four-hours on an 'E240' (four-hour) cassette.
For playback, the correct recording speed will automatically be selected.

❶ Switch on the TV set. If required, select the programme number for the video recorder.

❷ Press **MENU** on the remote control. The main menu will appear.

❸ Select line 'RECORD SPEED' using **P−↓** or **↑+P** and confirm with **OK**.

❹ Select the required recording speed with ← or →.

'SP'/'LP' AUTO'
'SP': **S**tandard**P**lay (normal recording speed) offers the usual first-class picture quality.

'LP': **L**ong**P**lay (half recording speed, double recording time). 8 hours can be recorded on a 4 hour cassette (E240) with a somewhat reduced picture quality.
'AUTO': **AUTO**matic Long Play. If there is not enough space on the tape to record a programmed recording in standard speed, the recording will automatically be made in 'LP' (Longplay). Otherwise, the recording speed will be 'SP' (Standardplay).

5 Confirm with **OK**.

6 To end, press **MENU**.

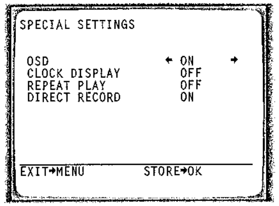
Automatic controlled recording from a satellite receiver (RECORD LINK)

This function automatically starts recording on the switched-off video recorder when a video signal is recognised through the connected scart cable. If your satellite receiver has a programming function, the recording will start automatically (as long as the satellite receiver is switched on).

1 Switch on the TV set. If required, select the programme number for the video recorder.

2 Press **MENU** on the remote control. The main menu will appear.

3 Select line 'SPECIAL SETTINGS' using **P –↓** or **↑+ P** and confirm with **OK**.



```
SPECIAL SETTINGS

OSD              ← ON   →
CLOCK DISPLAY      OFF
REPEAT PLAY        OFF
DIRECT RECORD      ON


EXIT→MENU        STORE→OK
```

4 Select line 'RECORD LINK' using **P –↓** or **↑+ P**.

5 Select function 'ON' with ← or →.

Switching off 'Record Link'
To switch off the function, select 'OFF'.

6 Confirm with **OK**.

7 To end, press **MENU**.

8 Insert a cassette.

9 Use a scart cable to connect scart socket **EXT.2 AV 2** on the video recorder to the corresponding scart socket on the satellite receiver.

10 Programme the satellite receiver with the required information (programme number of the TV channel, start time, end time).
If necessary, please see the operating instructions for your satellite receiver.

11 Switch off the video recorder with **STANDBY/ON** ⏻.

The video recorder is now ready to record. The beginning and end of the recording is controlled via scart socket **EXT.2 AV 2**.
When this function is switched on, '⛓' will appear on the video recorder display.

'Direct Record'

Can you record the right TV channel in seconds when the video recorder is switched off? No problem. If recording is started manually, the **switched-off** video recorder uses the current TV channel setted on the TV set.
You will find more information on how to switch 'Direct record' on or off in the next section 'Direct record'.

How does Direct Record work?
The video recorder compares the TV channel selected on the TV set with its stored TV channels via the scart cable. If the same TV channel is found, it switches the video recorder to the corresponding programme number and starts recording.
Please do not change the TV channel on the TV set during the search so as not to affect the process.

1 On the TV set, select the programme number you want make the recording from.

2 Press **RECORD/OTR ●** with the video recorder **switched off**.

× A 'search symbol' appears in the display (a moving symbol)
✓ The video recorder is comparing its saved TV channels with those of the TV set. Please do not change the TV channel on the TV set as long as the 'search symbol' (a moving symbol) is being displayed.

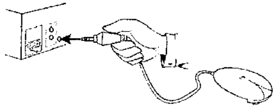
× 'NOTV' appears in the display
✓ This TV channel could not be found in the video recorder's memory.
Check that all TV channels saved on the TV set are available in the video recorder. If required, save any missing channels. Please read the section 'Manual TV channel search'.

3 Stop recording with **STOP ■**.

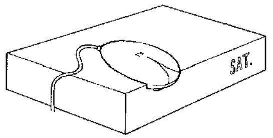
9 IR satellite control

This auxiliary device allows you to change the TV channels (programme numbers) of a connected digital satellite receiver (Set Top Box) via the video recorder. This is necessary to programme recordings which can only be made via a Set Top Box. A list of controllable Set Top Boxes is printed at the end of this section.

Connecting the satellite control

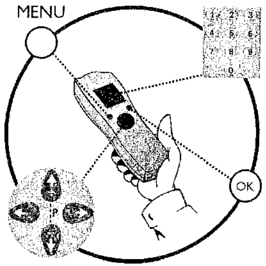


❶ Connect the satellite control to the socket **IR SAT** on the back of the video recorder.



❷ Position the satellite control on the Set Top Box so that the signal window on the bottom of the satellite control protrudes beyond the edge of the Set Top Box.
This allows the control signal (IR signal) to be transmitted and received by the Set Top Box without interference.

Preparing the satellite control

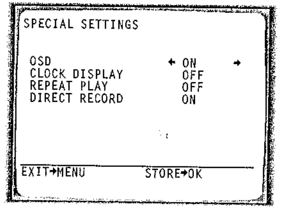


❶ Switch on the Set Top Box and select programme number 1 on your Set Top Box.

❷ Switch on your TV set and select the programme number that you have chosen for video playback.

❸ Press the **MENU** button on the video recorder remote control. The main menu is displayed.

❹ Select the line 'SPECIAL SETTINGS' with **P—↓** or **↑+P** and confirm with **OK**.



```
SPECIAL SETTINGS

OSD              ← ON    →
CLOCK DISPLAY      OFF
REPEAT PLAY        OFF
DIRECT RECORD      ON

EXIT→MENU      STORE→OK
```

❺ Select line 'SAT. IR-CODE NR.' with **P—↓** or **↑+P**.

❻ Enter the IR-code number that corresponds to your Set Top Box, using the number buttons **0-9** on the remote control.
A list of all available IR-code numbers is printed in the back of this section.

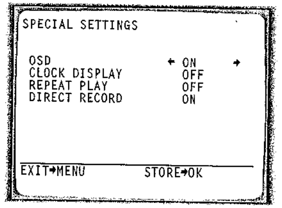
❼ After you have entered the last number, the Set Top Box will automatically switch to programme number 12.

Switching 'Direct Record' on or off

❶ Switch on the TV set. If required, select the programme number for the video recorder.

❷ Press **MENU** on the remote control. The main menu will appear.

❸ Select line 'SPECIAL SETTINGS' using **P—↓** or **↑+P** and confirm with **OK**.



```
SPECIAL SETTINGS

OSD              ← ON    →
CLOCK DISPLAY      OFF
REPEAT PLAY        OFF
DIRECT RECORD      ON

EXIT→MENU      STORE→OK
```

❹ In line 'DIRECT RECORD', select 'OFF' (Direct Record off) or 'ON' (Direct Record on) using ← or →.

❺ Confirm with **OK**.

❻ To end, press **MENU**.

❼ Switch off with **STANDBY/ON ⏻**.

×My Set Top Box does not switch to programme number 12
- ✓ Please check that you entered the correct code number. Repeat step ⑥ .
- ✓ Also try other code numbers.
- ✓ Please make sure that the IR electronic eye on the Set Top Box is not blocked.
- ✓ You may wish to reposition the SAT mouse (repeat steps ① and ⑥).

⑧ Confirm the correct code number with **OK** .

⑨ Affix the satellite control to the Set Top Box using the adhesive strip on the bottom of the satellite control.

⑩ To end, press the **MENU** button.

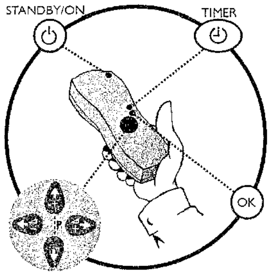
The satellite control has now been successfully installed.
Further information regarding the use of the satellite control for programmed recordings is included in chapter 'Programming a recording (TIMER)'.

IR-CODE table

Set Top Box	Provider	Country	code number
AMSTRAD DRX 100 Sky Digibox	Sky	UK	3
ASTON Xena 1500	Canal+	FR	13
CANAL+ Canalsatellite	Canal+	FR	1
ECHOSTAR D-2500-IP	Free-to-Air	D, FR, UK	11
GRUNDIG Digibox GDS200/1	Sky	UK	3
HUMAXF1-AVCI	Free-to-Air	D, FR, UK	2
NOKIA D-Box	Premiere World	D	5, 15
NOKIA 9200S	Free-to-Air	FR, UK	6
NOKIA 9850T	On Digital	UK	3
PACE DTR730-IM	On Digital	UK	12
PACE BSKYB 2200	Sky	UK	3
PANASONIC TU-DSB30	Sky	UK	3
PHILIPS DTX 6371	On Digital	UK	4
SAGEM ISD 3100	TPS	FR	14
SAGEM ISD 3200	TPS	FR	10
TPS Thomson	TPS	FR	10
TPS Sagem	TPS	FR	10
XCOM CDTV 2000	TPS	FR	7
XCOM CDTV 350	TPS	FR	9

The proper function of the satellite control can only be guaranteed for the listed combinations of Set Top Boxes and providers in the respective countries. Other combinations could influence the switching of the programme numbers or may not function properly.
Modifications of the technical specifications of the Set Top Boxes can cause the satellite control to malfunction.

10 Programming a recording (TIMER)



General information

Use programmed recording to automatically start and stop a recording at a later date. The video recorder will switch to the right programme number and begin recording at the correct time.
With this video recorder, you can pre-programme up to six recordings within a period of one month.

To make a programmed recording, your video recorder needs to know:
* the date you want to make the recording
* the programme number of the TV channel
* the start and stop time of the recording
* VPS or PDC on or off

This information is saved in a 'TIMER block'.

What is 'VPS/PDC'?

'VPS' (Video Programming System)/ 'PDC' (Programme Delivery Control) are used to control the start and duration of TV channel recordings. If a TV programme starts earlier or ends later than was scheduled, the video recorder will then turn on and off and the correct time.

What do I need to know about 'VPS/PDC'?

Usually the start time is the **same** as the VPS or PDC time. But if your TV guide gives a VPS or PDC time which is different from the programme's start time, e.g. '20.15 (VPS/PDC 20.14)', you must enter the **VPS/PDC time** '20.14' **exact to the minute** as the start time.
If you want to programme a time that is different from the VPS or PDC time, you must switch off VPS or PDC.

Only one TV program of a TV channel can be controlled using 'VPS/PDC' at a time. If you want to record two or more TV programmes on a TV channel using 'VPS/PDC', you will need to programme these as two separate recordings.

SHOWVIEW®

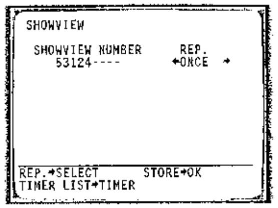
Programming a recording (with 'ShowView')

Thanks to this programming system, you no longer need to do tediously enter the date, programme number, start and end time. All the information needed for programming is contained in the ShowView-programming number. This 9-digit ShowView number is found in every TV listings magazine.

❶ Switch on the TV set. If required, select the programme number for the video recorder.

❷ Press **TIMER** ⏲ on the remote control.

❸ Enter the entire ShowView number. This number is up to 9 digits long and can be found next to the start time of the TV programme in your TV listings magazine.
e.g. 5-312-4 or 5 312 4
Enter 53124 for the ShowView-number.
If you make a mistake, you can clear your instructions with **CLEAR (CL)**.

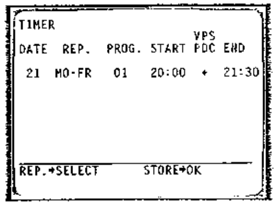


```
SHOWVIEW
  SHOWVIEW NUMBER      REP.
     53124----         ↔ONCE  →

REP.↔SELECT        STORE→OK
TIMER LIST→TIMER
```

Selecting onetime/daily/weekly recordings
Using **SELECT**, select from the following options:
'ONCE': Recording once
'MO-FR': Repeated daily recordings (Monday to Friday)
'WEEK.': Repeated weekly recordings (every week on the same day)

❹ Confirm with **OK**.



```
TIMER
                            VPS
DATE  REP.   PROG.  START  PDC  END
 21   MO-FR   01    20:00   →   21:30

REP.↔SELECT        STORE→OK
```

× **The following message appears on the screen: 'SELECT PROG. NR.'**
✓ The programme number of the TV channel has not yet been assigned to the ShowView number. Using the number buttons **0-9** on the remote control, select the corresponding programme number (name) of the TV channel and confirm with **OK**.

× **The following message appears on the screen: 'SHOWVIEW NUMBER NOT VALID'**
✓ The entered ShowView number is incorrect. Correct your instructions or end with **MENU**.
✓ Check the time/date (see chapter 'Installing your video', section 'Setting the time and date').

× **The following message appears on the screen: 'MO-FR PROGRAMMING NOT POSSIBLE FOR WEEKEND'**
✓ A daily recording was entered for the wrong day. Daily programming can only be used for recordings to be made from Monday to Friday.

❺ The decoded data appears after confirmation. You can go back at any time to change the data.

Switching on 'VPS/PDC' in the 'START' Input field
Select the 'START' input field using **TIMER** ⏲. Using **SELECT** switch on 'VPS/PDC' ('✶' lights up). If you press **SELECT** again, you will switch 'VPS/PDC' off ('✶' goes out).

❻ When all information is displayed correctly, confirm with **OK**. The programming information is stored in a TIMER block.

❼ Insert a cassette with an intact security tab (unprotected).

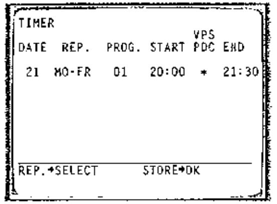
Using 'Tape List'
To save a recording in the 'Tape List' or to use a 'Tape List' cassette, enter the cassette number using the number buttons **0-9** on the remote control.
The cassette is being checked. You can find more information on the 'Tape List' in the chapter 'Tape List'.

❽ Switch off with **STANDBY/ON** ⏻.
The programmed recording will only function when the video recorder is **switched off** with **STANDBY/ON** ⏻.
If any of the TIMER blocks are in use, '⏲' will light up on the video recorder display.

Problems and solutions for programmed recordings

PROBLEM	SOLUTION
The video recorder will not operate	✓While a programmed recording is being made, you cannot operate your video recorder manually. If you want to cancel the programmed recording, press **STANDBY/ON ⏻**.
'SWITCH TO STANDBY- TIMER RECORDING' flashes on the TV screen	✓The video recorder was switched on several minutes before the start of a programmed recording. Switch off the video recorder with **STANDBY/ON ⏻**. A programmed recording (timer) will only function if the video recorder is switched off.
Cassette is ejected during recording	✓The end of the tape was reached during recording.
Error message: 'NO CASSETTE' ⏲ ' will flash in the video recorder display	✓No cassette was inserted. Insert a cassette and switch off the video recorder using **STANDBY/ON ⏻**.
Cassette was ejected as soon as the OK button was pressed	✓A cassette was inserted with the security tab removed. Undo the erase protection (chapter 'Manual Recording', section 'Preventing accidental erasing of cassettes') or insert a different cassette.
Error message: 'ALL TIMERS OCCUPIED'	✓If this error message appears after pressing **TIMER ⏲**, then all TIMER blocks are already programmed. No more recordings can be programmed. If you want to clear a programmed recording (TIMER block), select it with **↑+ P** or **P −↓** and then press **CLEAR (CL)**.

Programming a recording (without ShowView)



```
TIMER
                               VPS
DATE  REP.   PROG.  START  PDC  END
 21   MO-FR   01    20:00   *   21:30



REP.→SELECT        STORE→OK
```

❶ Switch on the TV set. If required, select the programme number for the video recorder.

❷ Press **TIMER ⏲** on the remote control **twice**. A free TIMER block will be highlighted.

❸ Press **TIMER ⏲**. The information will appear on the screen.

❹ With **TIMER ⏲**, **→** or **←** you can select 'DATE' (date), 'PROG.' (programme number), 'START' (start time) and 'END' (end time). Enter or change your information with **↑+ P** or **P −↓**, or with the number buttons **0-9** on the remote control.

Selecting onetime/daily/weekly recordings
In 'DATE' use **SELECT** to select from the following options:
'ONCE': Recording once
'MO-FR': Repeated daily recordings from Monday to Friday
'WEEK.': Repeated weekly recordings (every week on the same day)

Programme numbers of the 'E1' and 'E2' scart socket
You can also programme recordings from external sources via scart socket **EXT.1 AV 1** (E1) or **EXT.2 AV 2** (E2).

'Switching on 'VPS/PDC' in the 'START' input field
Select the 'START' input field using **TIMER ⏲**. Using **SELECT** switch on "VPS/PDC" ('*' lights up). If you press **SELECT** again, you will switch "VPS/PDC" off ('*' goes out).

❺ When all information is displayed correctly, confirm with **OK**. The programming information is stored in a TIMER block.

❻ Insert a cassette with an intact security tab (unprotected).

Using 'Tape List'
To save a recording in the 'Tape List' or to use a 'Tape List' cassette, enter the cassette number using the number buttons **0-9** on the remote control.
The cassette is being checked. You can find more information on the 'Tape List' in the chapter 'Tape List'.

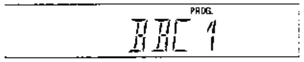
❼ Switch off with **STANDBY/ON ⏻**.
The programmed recording will only function when the video recorder is **switched off** with **STANDBY/ON ⏻**.
If any of the TIMER blocks are in use, '⏲' will light up on the video recorder display.

Problem solving for programmed recordings

PROBLEM	SOLUTION
The video recorder does not react	✓While a programmed recording is being made, you cannot operate your video recorder manually. If you want to cancel the programmed recording, press **STANDBY/ON ⏻**.
'SWITCH TO STANDBY- TIMER RECORDING' flashes on the TV screen	✓The video recorder was switched on several minutes before the start of a programmed recording. Switch off the video recorder with **STANDBY/ON ⏻**. A programmed recording (timer) will only function if the video recorder is switched off.
A cassette was automatically ejected during recording	✓The end of the tape was reached during recording.
Error message: 'NO CASSETTE' '⏲' will flash in the video recorder display	✓No cassette was inserted. Insert a cassette and switch off the video recorder using **STANDBY/ON ⏻**.
The 'PROTECTED CASSETTE' error message appears briefly on the screen then the cassette is ejected.	✓A cassette was inserted with the security tab removed. Undo the erase protection (chapter 'Manual Recording', section 'Preventing accidental erasing of cassettes') or insert a different cassette.
Error message: 'ALL TIMERS OCCUPIED'	✓If this error message appears after pressing **TIMER ⏲**, then all TIMER blocks are already programmed. No more recordings can be programmed. If you want to clear or check a programmed recording (TIMER block), select it with **↑+P** or **P−↓**.
The 'DATA ERROR' message appears on the screen.	✓The data for the recording could not be transferred. Please check date, start time and end time of the programmed recording.

Programming a recording with 'TURBO TIMER'

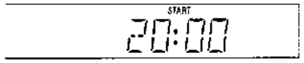
With this function, programming a recording that takes place within the next 24 hours, will be quick and easy. The following pre-set information will appear in the display when you programme a recording using 'TURBO TIMER'.
Programme number = the programme number currently selected (TV channel)
Start time = current time
End time = current time +2 hours



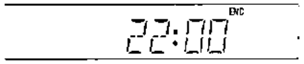
❶ Press **TURBO TIMER** on the remote control.
The current set programme number will appear in the display, for instance, 'PROG. 01'. If required, you can change this using **↑+P** or **P−↓**.

×'CLK' will flash in the video recorder display
✓ This display means that the video recorder clock is not set correctly. Please read the section 'Setting the time and date' in chapter 'Installing your video recorder'

Controlling the satellite receiver (IR-Sat control)
Using **SELECT**, you can change the input for a satellite TV channel.
'S----' will appear in the display. Enter the programme number for the satellite TV channel using the number buttons **0-9** on the remote control.
Attention: For this to work, the IR-Sat control must be installed correctly (chapter 'IR Sat control', 'Connecting the Sat control'.



❷ Press **TURBO TIMER**.
The current time (= start time) will appear in the display, for instance, 'START 20:00'. If required, you can change this using **↑+P** or **P−↓**.



❸ Press **TURBO TIMER**.
The end time will appear in the display, for instance, 'END 22:00'. 'END 22:00'. If required, you can change this using **↑+P** or **P−↓**.

❹ Press **TURBO TIMER**.
'OK' will briefly appear in the video recorder display. Programming is now complete.

❺ Insert a cassette with an intact security tab (unprotected).

Using Tape List
Enter the cassette number with the number buttons **0-9** .
The cassette is being checked. You can find more information on the 'Tape List' in the chapter 'Tape List'.

❻ Switch off with **STANDBY/ON ⏻** .
The programmed recording will only function when the video recorder is **switched off** with **STANDBY/ON ⏻** .
If any of the TIMER blocks are in use, ' ⏲ ' will light up on the video recorder display.

Problems and solutions for programmed recordings

PROBLEM	SOLUTION
The video recorder does not react	✓While a programmed recording is being made, you cannot operate your video recorder manually. If you want to cancel the programmed recording, press **STANDBY/ON ⏻** .
' ⏲ ' will flash in the video recorder display	✓The video recorder was switched on several minutes before the start of a programmed recording. Switch off the video recorder with **STANDBY/ON ⏻** . A programmed recording (timer) will only function if the video recorder is switched off. ✓No cassette was inserted. Insert a cassette and switch off the video recorder using **STANDBY/ON ⏻** .
Cassette is ejected during recording.	✓The end of the tape was reached during recording.
The 'PROT' error message appears briefly in the display then the cassette is ejected.	✓A cassette was inserted with the security tab removed. Undo the erase protection (chapter 'Manual Recording', section 'Preventing accidental erasing of cassettes') or insert a different cassette.
Error message: 'FULL'	✓If this error message appears after pressing **TIMER ⏲** , then all TIMER blocks are already programmed. No more recordings can be programmed. If you want to clear or check a programmed recording (TIMER block), select it with **↑+P** or **P−↓** .

How to check, change or delete a programmed recording (TIMER)

❶ Switch on the TV set. If required, select the programme number for the video recorder.

❷ Press **TIMER ⏲** on the remote control **twice** .

❸ Select the programmed recording (TIMER) you want to check, change or delete with **P−↓** or **↑+P** .

Delete programmed recording
Press **CLEAR (CL)** .
'--' appears rather than the displayed values
To end, press **MENU** .

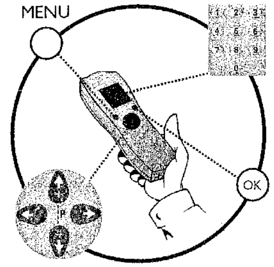
❹ Press **TIMER ⏲** .
Select the input field with **←** or **→** .
If required, change the information with **↑+P** , **P−↓** or the number buttons **0-9** .

❺ Confirm with **OK** .

❻ Switch off with **STANDBY/ON ⏻** .

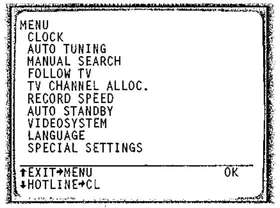
11 Other functions

Changing the video (colour) system



If you playback recordings made on other video recorders or you want to record from external sources (via the scart socket), the automatic video (colour) system switch-over may lead to colour distortion.
You can switch off the automatic TV system switch-over as follows.

Video (colour) systems
Other countries, other video (colour) systems:
In central Europe transmissions are broadcast in the PAL system (Phase Alternation Line) standard. France uses SECAM (Séquentiel à mémoire). In some countries (USA and Japan), TV viewers receive their programmes as an NTSC signal (National Television System Committee).



```
MENU
 CLOCK
 AUTO TUNING
 MANUAL SEARCH
 FOLLOW TV
 TV CHANNEL ALLOC.
 RECORD SPEED
 AUTO STANDBY
 VIDEOSYSTEM
 LANGUAGE
 SPECIAL SETTINGS
↑EXIT→MENU                    OK
↓HOTLINE→CL
```

❶ Press **MENU** on the remote control **before you start recording** or **during playback**. The main menu will appear.

❷ Select line 'VIDEOSYSTEM' using **P—↓** or **↑+P** and confirm with **OK**.

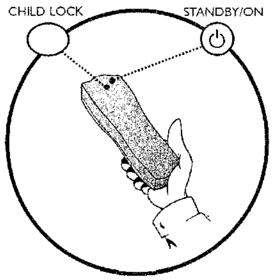
❸ Select the TV (colour) system with the least disruptions using → or ←.
If colour interference still occurs, you can switch to 'B/W' (black and white).

❹ Confirm with **OK**.

❺ To end, press **MENU**.

How can I change back to 'Automatic Switch-over'?
If you change the programme number, the video (colour) system for recording will switch itself back to 'AUTO' (automatic switch-over).
If you eject the cassette, the video (colour) system for playback will switch itself back to 'AUTO' (automatic switch-over).

Child lock



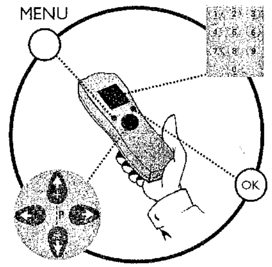
You can prevent unauthorised use of your video recorder with this function. When the child lock is active, the buttons on the front of the device are blocked (will not function). You can make programmed recordings while the child lock is on.

❶ With the video recorder switched on, press **CHILD LOCK** on the remote control for **five seconds**. 'σ' will appear on the video recorder display.

❷ Put away the remote control somewhere out of reach of children.

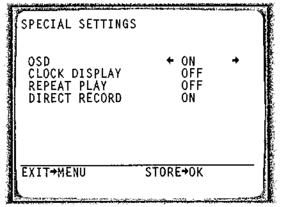
❸ If you want to switch off the child lock, press **CHILD LOCK** again for **five seconds**, with the video recorder switched on. 'σ' will disappear from the video recorder display.

x 'σ' will flash in the video recorder display
✓ This symbol flashes when a button is pressed when the child lock is active.



Switching the on-screen display (OSD) off or on

Along with the on screen menu, the OSD (On Screen Display) also displays information on the current operating status (counter, playback, recording, TV channel, etc.) on the TV screen. You can switch off the information about the operating status so that the on screen display (OSD) is not recorded when copying video cassettes.



```
SPECIAL SETTINGS

 OSD              ← ON    →
 CLOCK DISPLAY      OFF
 REPEAT PLAY        OFF
 DIRECT RECORD      ON



EXIT→MENU       STORE→OK
```

❶ Switch on the TV set. If required, select the programme number for the video recorder.

❷ Press **MENU** on the remote control. The main menu will appear.

❸ Select line 'SPECIAL SETTINGS' using **P −↓** or **↑+ P** and confirm with **OK**.

❹ In the line 'OSD', select the desired setting with → .

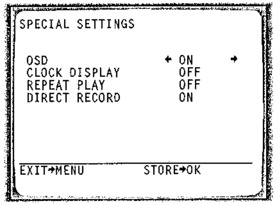
Which settings can I choose?
'ON': Shows the OSD for a few seconds only.
'OFF': Switches off the OSD.

❺ Confirm with **OK**.

❻ To end, press **MENU**.

Switch off the clock display

To save energy, you can switch off the clock display on the video recorder. Programmed (TIMER) recordings will still take place.



```
SPECIAL SETTINGS

 OSD              ← ON    →
 CLOCK DISPLAY      OFF
 REPEAT PLAY        OFF
 DIRECT RECORD      ON



EXIT→MENU       STORE→OK
```

❶ Switch on the TV set. If required, select the programme number for the video recorder.

❷ Press **MENU** on the remote control. The main menu will appear.

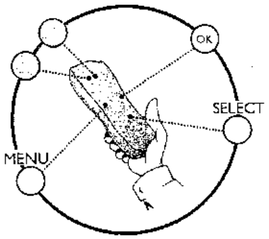
❸ Select the line 'SPECIAL SETTINGS' with **P −↓** or **↑+ P** and confirm with **OK**.

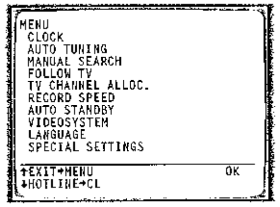
❹ To switch off the time display on the video recorder, select in the line 'CLOCK DISPLAY' with → 'OFF'.

How can I switch on the clock display?
Select with ← 'ON' (time display switched on).

❺ Confirm with **OK**.
'STORED' will briefly appear on the TV screen.

❻ To end, press **MENU**.




```
MENU
 CLOCK
 AUTO TUNING
 MANUAL SEARCH
 FOLLOW TV
 TV CHANNEL ALLOC.
 RECORD SPEED
 AUTO STANDBY
 VIDEOSYSTEM
 LANGUAGE
 SPECIAL SETTINGS
↑EXIT→MENU              OK
↓HOTLINE→CL
```

Switching the remote control command

If you use a second video recorder that reacts to the same remote control command (stop, play, record, etc.) as this video recorder, then you can change the remote control and this video recorder.

❶ Switch on the TV set. If required, select the programme number for the video recorder.

❷ Press **MENU** on the remote control. The main menu will appear.

❸ Press the **SELECT** button on the remote control. In addition, press the number button **2** to change the remote control to 'VCR2'.

❹ Confirm with **OK**.
The main menu will disappear. If you have switched the remote control and the video recorder to 'VCR2', 'RESPONDS TO VCR2' will appear on the TV screen.

What do I need to pay attention to when changing the remote control and video recorder?

You must always change both video recorder and remote control to the same setting, e.g. video recorder **and** remote control to 'VCR1' or 'VCR2'.

After you change the batteries in the remote control, it will switch back to 'VCR1'.

How can I change back to 'VCR1'?

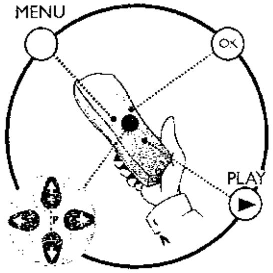
- Press **MENU**. The main menu will appear.
- Press the **SELECT** button on the remote control. Then press the number button **1** to change the remote control to 'VCR1'.
- Confirm with **OK** on the remote control. The main menu will disappear. This picture will appear on the screen: 'RESPONDS TO VCR1'

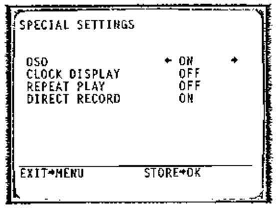
× The main menu will not disappear and no message appears.

✓ The remote control command was not recognised by the video recorder. Repeat step ❸.

× This will, for example, appear in the display: 'VCR2'

✓ Remote control and video recorder were not both changed. If you press a button for a long time, the video recorder settings appear in the display. In this case 'VCR2'. You need to also change the remote to 'VCR2' (button **SELECT** and **2**).




```
SPECIAL SETTINGS

OSD              ← ON    →
CLOCK DISPLAY      OFF
REPEAT PLAY        OFF
DIRECT RECORD      ON

EXIT→MENU       STORE→OK
```

Continuous playback

This function can be used to play a cassette over and over again. When the end of the cassette is reached, the video recorder will rewind and start from the beginning again. This function is activated or deactivated as follows.

❶ Press **MENU** on the remote control. The main menu will appear.

❷ Select line 'SPECIAL SETTINGS' using **↑+P** or **P−↓** and confirm with **OK**.

❸ Select line 'REPEAT PLAY' using **↑+P** or **P−↓**.

❹ Select function 'ON' with **←** or **→**.
If you select 'OFF', continuous playback will be switched off.

❺ Confirm with **OK**.
'STORED' will appear briefly on the screen.

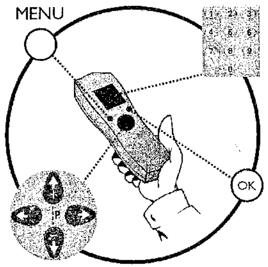
❻ To end, press **MENU**.

❼ Insert a cassette.

Using 'Tape List'

Enter the 'Tape List' cassette number with the number buttons **0-9** on the remote control.
The cassette is being checked. You can find more information on the 'Tape List' in the chapter 'Tape List'.

❽ Start the continuous playback with the **PLAY ▶** playback button.



Automatic switch-off

If you haven't used the video recorder for a few minutes in certain modes (e.g.: STOP), it will switch to standby automatically. You can cancel this function to use the video recorder as a television receiver.

❶ Switch on the TV set. If required, select the programme number for the video recorder.

❷ Press **MENU** on the remote control. The main menu will appear.

❸ Select line 'AUTO STANDBY' using **P –↓** or **↑+ P**.

❹ Select '**OFF**' (no automatic switch-off) or '**ON**' (automatic switch-off) with the menu buttons **→** or **←**.

❺ Confirm with **OK**. 'STORED' will briefly appear on the TV screen.

❻ To end, press **MENU**.

Using your video recorder remote control with your TV set

With the enclosed multicode remote control you can control the main functions of your TV set. To do this, you must first enter a code number that corresponds to the make of your TV set. You will find a summary of all available remote control commands on the last page of this manual.

❶ Hold down the **⊿–** button.

❷ Using the number buttons **0-9**, enter the code number that corresponds to the make (manufacturer) of your TV set.
When you have entered the code number correctly, the TV set will switch off.

× My TV set will not switch off.
✓ Also try to enter code numbers of other manufacturers.
✓ In some cases, it is possible that your TV set will not react to the selected code numbers. If this is the case, you unfortunately cannot use this function.

By using the **TV** buttons on the panel in the middle of the control, you can::

+⊿	increase the TV volume
⊿–	decrease the TV volume
+TV	next programme number
TV–	previous programme number

To switch off the TV (**TV** ⏻), press **⊿–** and **TV–** at the same time.

12 Suppressing interference

Selecting the sound channel

You can select the desired sound channel during playback or while receiving TV channels via the video recorder. This allows you to select a desired language for multi-language transmissions.

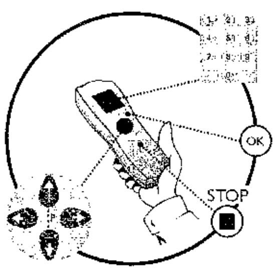
❶ Press **SELECT** . This will show the current sound setting.

What goes on behind the settings?
'STEREO':
Left and right stereo (HIFI) sound tracks can be heard.
'LEFT':
The left stereo (HIFI) sound track can be heard.
'RIGHT':
The right stereo (HIFI) sound track can be heard.
'MONO':
The mono (linear) sound track can be heard.
'MIXED':
The mono (linear) sound track can be heard at the same time as the stereo (HIFI) sound tracks.

❷ Keep pressing **SELECT** until the desired setting appears in the display.

Automatic switch to 'MONO'
If a TV channel does not transmit a stereo signal or if there is no stereo signal recorded on the video cassette, the video recorder will automatically switch to 'MONO'. You will not be able to select any other settings.

Playing back an audio dubbing
When dubbing video recordings, the mono (linear) sound track is recorded with a new sound signal. The stereo (HIFI) sound track is kept. To hear the dubbed section, you must select either 'MONO' or 'MIXED'.



Optimising the modulator

In some reception locations it is possible that a TV channel will be sent on the same or similar frequency as the video recorder.
Result: As soon as the video recorder is switched on, the reception quality for this or several other TV channels will decreased.
The following steps will show you how to change the pre-set 'transmission' (modulator) frequency on the video recorder.

What is a modulator?
This electronic component in the video recorder allows the device to transmit audio and video signals via the aerial cable. These signals can be received TV set just like TV channels.

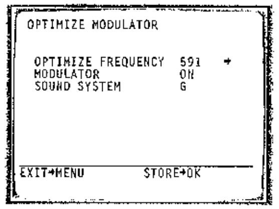
What is an modulator frequency?
This frequency or channel indicates the frequency or channel on which the audio or video signal is transmitted.

❶ Switch on the TV set. Select the programme number used for video recorder playback (see TV operating instructions).

❷ Press **STOP/EJECT ■/▲** to eject any cassette that might be in the device.

❸ Press the **STOP ■** button on the remote control. Then press **STOP/EJECT ■/▲** until, e.g. '591' appears in the display.

The video recorder will now transmit a test image on UHF channel 36/Frequency 591MHz.



```
OPTIMIZE MODULATOR

OPTIMIZE FREQUENCY  591  →
MODULATOR           ON
SOUND SYSTEM        G


EXIT→MENU        STORE→OK
```

❹ Select line 'OPTIMIZE FREQUENCY' using **↑+P** or **P−↓** . Enter the new modulator frequency with the number buttons **0-9** .

❺ Tune in the TV set to the new modulator frequency (channel 21 - 69) shown in the video recorder display.

× Sound interference occurs
✓ The wrong sound system could have been selected.
In line 'SOUND SYSTEM', select the TV system with the least sound disruptions using → or ← . 'G' (TV system PAL-B.G) or 'K' (TV system SECAM-D.K).

❻ Confirm with **OK** .
'STORED' will appear briefly on the screen.

Optimising the modulator is now complete.

Switching the modulator on / off

If you cannot clear picture or sound interference despite optimisation, you can switch off the built-in modulator.

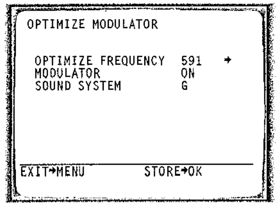
Warning:

this is only possible if you have connected the video recorder to the TV set with a scart cable. Without a scart cable you will not receive a picture from the video recorder on the TV set when the modulator is switched off.

❶ Switch on the TV set. If required, select the programme number for the video recorder.

❷ Press **STOP/EJECT ■/▲** to eject any cassette that might be in the device.

❸ Press the **STOP ■** button on the remote control. Then press **STOP/EJECT ■/▲** until, e.g. 'M591' appears in the display.



```
OPTIMIZE MODULATOR

 OPTIMIZE FREQUENCY  591  →
 MODULATOR           ON
 SOUND SYSTEM        G

EXIT→MENU       STORE→OK
```

❹ Select the line '**MODULATOR**' on the TV screen or 'MOD+' in the display with **↑+P** or **P−↓** .

❺ On the screen select '**OFF**' or in the display 'MOD-' (modulator off) with ← .

How can I switch the modulator back on?

In the display, select 'MOD+' (modulator on) with ← .

❻ Confirm with **OK** .

❼ To end, press **MENU** .

13 Before you call an engineer

If, contrary to expectation, you have any problems using this video recorder, it may be caused by the following reasons.

You will find the phone number in the enclosed guarantee leaflet.

The telephone numbers can be found on the back of this instruction manual. Have the model number (MODEL NO) and the production number (PROD.NO.) of your video recorder ready.

HOTLINE telephone numbers

The telephone numbers for after-sales service (HOTLINE) are also saved in your video recorder. To call them up, proceed as follows:

❶ Switch on the TV set. If required, select the programme number for the video recorder.

❷ Press **MENU** . The main menu appears.

❸ Press **CLEAR (CL)** . The after-sales service telephone numbers will appear on the screen.

❹ Using **OK** , you can select more telephone numbers.

❺ To end, press **MENU** .

PROBLEM	SOLUTION
Your video recorder does not respond to any button being pressed:	✓There is no power supply: check the power supply. ✓A programmed recording is currently being made: if desired, cancel the programmed recording with **STANDBY/ON** ⏻ . ✓Child lock active: switch the child lock off. ✓There is a technical problem: disconnect from the mains power supply for 30 seconds, then connect again. If this doesn't help, you could reset your video recorder to the default factory settings.
Resetting devices to default factory settings	✓**Attention:** All the information stored (TV channels, time and date, TIMER) will be cleared. 1. Disconnect from the mains power supply. 2. Press and hold the **STANDBY/ON** ⏻ button on the device and reconnect to the mains power supply. 3. Release the button when 'OSD' appears in the video recorder display.
Cassette is jammed in the video recorder:	✓Don't use force. Pull out the mains plug for a moment.
Remote control does not work:	✓Remote control not pointed toward the video recorder: point it at the video recorder. ✓There is a technical problem: Take out the batteries, wait for 10 seconds and place them back. ✓Batteries have run out: change the batteries. ✓You have given the wrong remote control command: read 'Switching remote control command' in chapter 'Additional functions'.

PROBLEM	SOLUTION
No picture when you play a cassette:	✓There is no recording on the cassette: change the cassette. ✓You have selected the wrong programme number on the TV for playing cassette: on the TV, select the correct programme number for the video recorder. ✓The cable connecting the TV set and the video recorder has come loose: check the cable.
Poor picture quality when you play a cassette:	✓Your TV set is not properly adjusted. ✓The cassette is badly worn or of poor quality: use new cassette. ✓Tracking is not properly adjusted: turn to chapter 'Eliminating picture interference' and read the section 'Optimising tracking'. ✓Read the section 'Selecting the picture settings (SMART PICTURE)' in the chapter 'Playback'. ✓You haven't selected the correct video (colour) system for playback: Turn to chapter 'Additional functions' section 'Changing the video (colour) system'.
No recording possible:	✓The TV channel you want to record is not stored or you selected the wrong programme number: check TV channels stored. ✓A cassetto was inserted that does not have the security tab (cannot be used to record): Insert a cassette with an intact security tab or change cassette. For more information, please see the section 'Preventing accidental erasing of cassettes' in chapter 'Manual Recording'. ✓'VPS/PDC' switched on but 'VPS/PDCtime' wrong: 'enter 'VPS/PDCtime exactly to the minute. Have your aerial checked.
Programmed recording does not work:	✓You have programmed the wrong time or date: check time and date. ✓Check time and date. If time and date are wrong despite manual setting, you can switch 'SMART CLOCK' off. Please read the section 'Setting the time and date' in the chapter 'Installing your video recorder'. ✓You have not set the TIMER properly: Check the programmed recordings (TIMER block). ✓You have put in a cassette that cannot be recorded on: undo the erase protection on the cassette.
The wrong TV channel was decoded (entered) after you programmed a recording using ShowView	✓1. Enter the ShowView programming number of the desired TV channel. 2. Confirm with **OK**. 3. Check the programme number/channel name in the 'PROG.' input field. 4. If this does not correspond to the desired TV channel, select the input field and change the programme number/channel name. 5. Confirm with **TIMER ⏻**.
There is picture or sound interference on TV reception:	✓Turn to chapter 'Suppressing interference' and read 'Optimising the modulator' and 'Switching on/off the modulator'. ✓Have your aerial checked. ✓You will find information on how to switch the TV system in chapter 'Installing your video recorder' section 'Manual TV channel search'.

Remote control codes

Acura	02
Adyson	05, 20
Akai	33,18
Akura	21, 25
Alba	02, 21, 07
Allorgan	28
Amplivision	20
Amstrad	02
Anitech	02
Arcam	20
Asuka	21
Audiosonic	15
BPL	26
BSR	28
BTC	21
Basic Line	02, 21
Baur	33,03
Beko	35
Binatone	20
Blaupunkt	17
Blue Sky	21
Blue Star	26
Bondstec	23
Boots	20
Brandt	15
Bush	21, 02, 07, 26, 28, 36, 42
CGE	23
CTC	23
Carrefour	07
Cascade	02
Cimline	02
Clatronic	23, 35
Condor	30, 35
Contec	02, 07
Crown	35, 02, 38
Cybertron	21
Daewoo	36, 02
Dainichi	21
Dayton	02
De Graaf	18
Decca	10
Dixi	02
Dual	42
Elite	21, 30
Elta	02
Emerson	33
Ferguson	15
Fidelity	33
Finlandia	32, 18
Finlux	32, 13, 10
Firstline	31, 02, 20, 23, 28
Fisher	20, 18, 35
Flint	40
Formenti	30
Frontech	23, 25
Fujitsu	10
Funai	28, 25
GEC	10, 20
GPM	21
Geloso	02
Genexxa	21
GoldStar	20, 15, 27
Goodmans	10, 07, 20, 29, 36
Gorenje	35
Graetz	33
Granada	10, 18, 20
Grandin	26
Grundig	17
HCM	02, 26
Hanseatic	33, 30, 01
Hinari	02, 07, 21
Hisawa	26, 40
Hitachi	22, 15, 08, 05, 20, 07, 13
Huanyu	36
Hypson	25, 26
ICE	20, 25
ICeS	21
ITT	33
Imperial	23, 38, 35
Inno Hit	10
Interfunk	33, 23
Intervision	12, 20, 25
Isukai	21
JVC	09, 07
Kaisui	21, 20, 02, 26
Kathrein	01
Koyoda	02
Leyco	10, 25, 28
Lloytron	05
Luxor	33
M Electronic	32,13,20,02,15,36,41
Magnadyne	12, 23
Magnafon	12
Manesth	30, 20, 25
Marantz	01
Matsui	02,39,18,20,04,06,07,10,28
Memorex	02
Metz	34
Mitsubishi	07, 14, 16
Mivar	27
Multitech	02, 12
Neckermann	01
Nikkai	06, 21, 05, 10, 25
Nobliko	12
Nokia	41, 33
Nordmende	15
Oceanic	33
Orion	28, 30, 31, 39
Osaki	05, 10, 20, 21, 25
Oso	21
Osume	05, 10
Otake	29
Otto Versand	03, 07, 20, 30, 01
Palladium	35, 38
Panama	20, 25
Panasonic	24, 34
Pathe Cinema	30
Pausa	02
Perdio	30
Phase	05
Philco	23
Philips	01, 36
Pioneer	15
Profex	02, 33
Proline	31
Protech	12, 02, 20, 23, 25, 38
Quelle	03, 04, 33
Questa	07
Rank Arena	07
Rediffusion	33
Rex	25
Roadstar	02, 25, 21, 38
SEG	20, 07, 25
SEI	12, 03, 28
Saba	15
Saisho	04, 02, 25
Salora	33
Sambers	12
Samsung	20, 25, 27, 35, 02, 01
Sanyo	07, 18, 04, 10
Schaub Lorenz	33
Schneider	21, 23
Sentra	06
Sharp	11, 07
Shorai	28
Siarem	12
Siemens	17
Silver	07
Sinudyne	12, 03, 28
Solavox	05
Sonitron	18
Sonoko	02
Sonolor	18
Sony	04, 03, 07
Soundwave	38
Standard	20, 21, 02
Sunkai	28, 31
Susumu	21
Tandy	21, 10, 20
Tashiko	07, 20
Tatung	10, 20
Tec	20, 23
Technema	30
Technics	24
Telefunken	15
Telemeister	30
Teletech	07, 20
Teleton	20
Tensai	21, 28, 29, 30
Texet	21
Thomson	15
Thorn	06, 10, 33
Tomashi	26
Toshiba	06, 07
Uher	30
Ultravox	12
Universum	13, 32, 25, 35
Videosat	23
Videotechnic	20
Vision	30
Waltham	20
Watson	30
Watt Radio	12
Wega	07
White Westinghouse	30
Yoko	20, 25

4. Dismantling instructions

4.1 Dismantling instructions

General guidelines for dismantling housing components, electronic parts and the drive mechanism

Always disconnect from mains before dismantling or assembly.

Due to the supply voltages (hot circuit) on the primary side of the switched-mode power supply, an isolating transformer is required for the operation of the device.

The drive or the drive/motherboard unit must not be pulled out by the cross struts!

Components placed below the tape deck has to be inserted exactly.

The use of a regulating isolating transformer is recommended for detecting faults around the power supply.

All screws of the video recorder can be removed or tightened with a 10* torx screwdriver .

1. Housing cover (Figure 4-1)
- Remove the four screws (A).
- Push catch (S) inwards, lifting lid at the same time to move out of groove.
- Slide housing cover back by approx. 1 cm.
- Push centre of housing cover sides on underside approx. 1 cm outwards and lift up the housing cover.

Assembly
Assemble in reverse order.

2. Base plate (Figure 4-2)
The base plate may not be removed from the frame!

3. Front panel (Figure 4-2)

Preparation
Dismantle the housing lid as described in section 1.

- Position the device with the base plate facing upwards.
- Undo the six catches (S) one after the other, starting from the left or the right.
- Remove the front panel by pulling it forwards.
- For devices with shuttle print or socket print, disconnect the cabling to the motherboard.

Assembly
Assemble in reverse order (device in operational position).

Important
- The lift flap lever should be connected to the lift flap guide.
- Check that all catches are engaged.

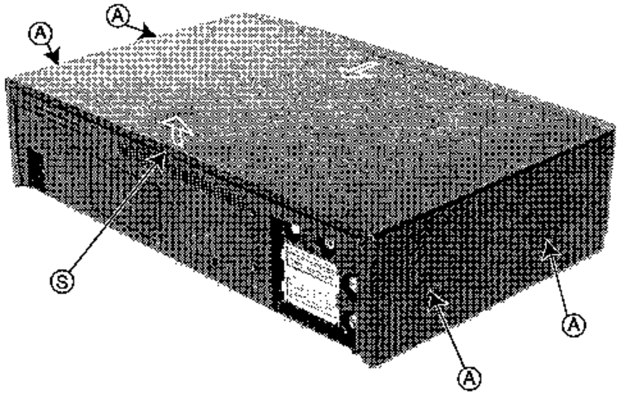


Figure 4-1

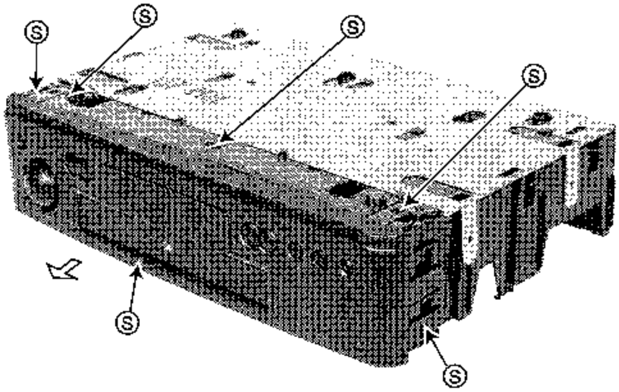
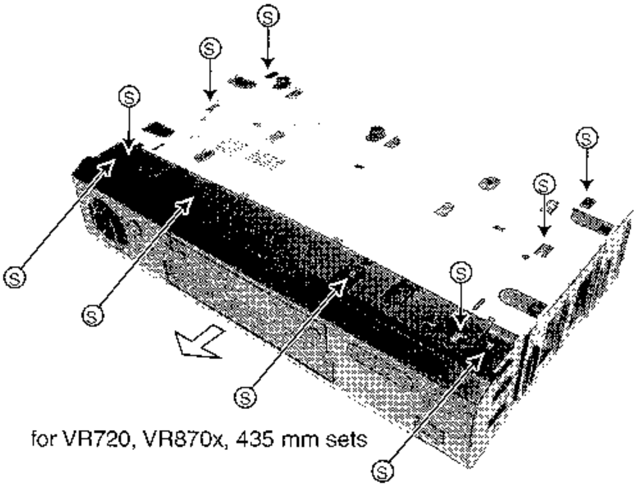


Figure 4-2



for VR720, VR870x, 435 mm sets

4.2 Dismantling of the motherboard/drive combination (Figure 4-3 and 4-4)

Preparation
Remove the housing cover as described in section 1.
Remove the front panel as described in section 3.

- Move device into operational position (Figure 4-3).
- Undo the two screws (B) of the stay and pull it up to remove it.
- Push back the lift by 5 cm after releasing both lift stops.
- Undo and remove the four fastening screws (C) of the drive.
- Detach the Cinch socket cable (K) and ground cable (M) from the socket print (if present).
- Remove the cables (K1; K2; K3) from the guides on the rear of the frame.
- Pull the Cinch socket holder with the socket and print up and out of the frame (if present).
- Position the device with the base plate facing up.
- Undo the 8 catches (S) from the rear right to the rear front and then from the rear left to the front left.
- After the weight of the motherboard/drive unit has released it from the frame, the catch (S) at the mains socket has to be released for a second time.
- The frame can be removed by lifting it off.
- Turn the motherboard/drive unit and move it into the service position (Figure 4-6), if necessary.
- The device is operational in this position

"Eject" must NOT be used !!!

Caution:
Adjustments can not be made in the service position.
"Eject" must NOT be used !!!

Assembly

- Position the frame with the top open onto a level surface.
- Hold the drive on the side at the lift and insert the motherboard/drive unit into the frame, pushing it down lightly. Observe that the power Supply and Scart sockets are positioned in openings.
- Check that all 8 catches (S) are engaged.
- Secure the drive with the four holding screws (C).
- Move the lift into the "Eject" position.
- Push the stay onto the frame with the chamfered side facing to the rear and secure with both screws (B).
- Insert the Cinch socket into the opening and ensure that it engages.
- Connect the Cinch socket and the ground cable (K ; M) (if present).

- **Insert the cables (K1; K2; K3) into the supports provided in the frame.**

- Replace the front panel and the housing cover.

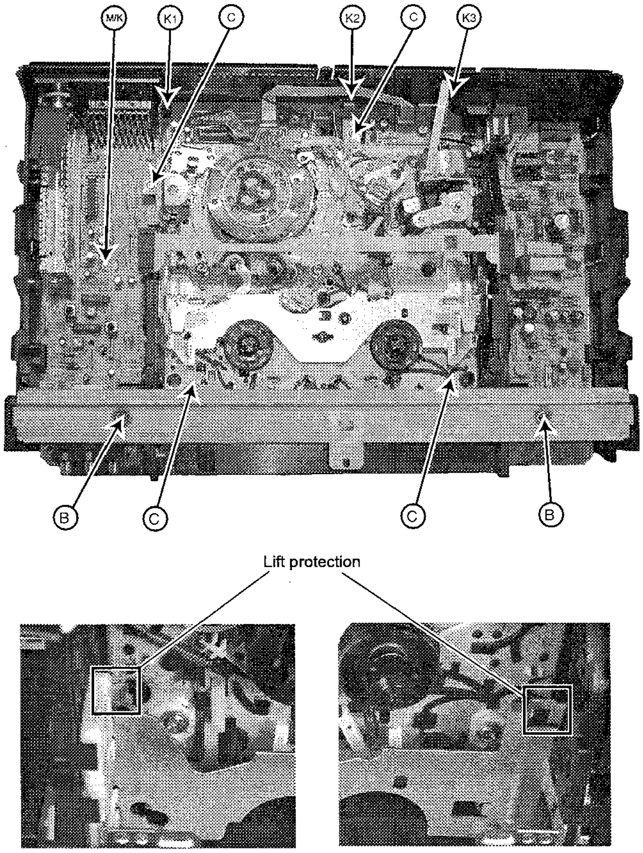


Figure 4-3

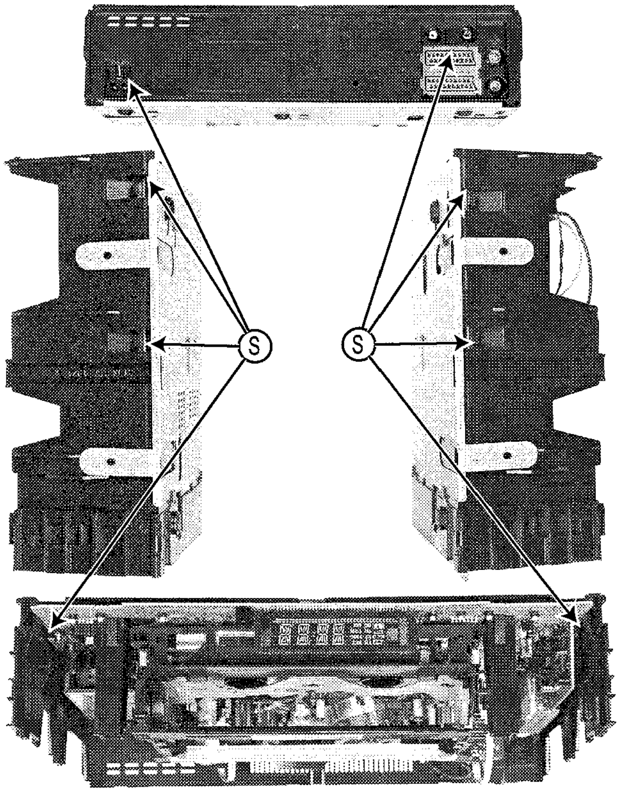


Figure 4-4

4.3 Dismantling the drive (Figure 4-3, 4-5 and 4-6)

Preparation
Remove the housing cover as described in section 1.
Remove the front panel as described in section 3.

- Undo the two screws (B) of the stay and pull it up to remove it.
- Push back lift by 5 cm after releasing both lift stops.
- Undo and remove the four fastening screws (C) of the drive.
- Undo and remove the ground screw (D) at the rear.
- (For this purpose, insert the screwdriver through the hole in the back panel).
- Remove the cables from the drive.
- Bend back the guard of the scanner cable.
- Remove the scanner cable from the socket.
- Return the lift into the "Eject" position.
- Slightly lift the left rear side of the drive to undo the connector to the capstan motor.
- Press both catches (S) together with fine pliers and lift the drive around the snapholders.
- The drive may be separated from the motherboard.

Assembly
Assemble in reverse order.

Important
Observe that the cables (K1; K2; K3) are positioned in the supports on the rear of the frame and that the ground screw (D) is screwed in!

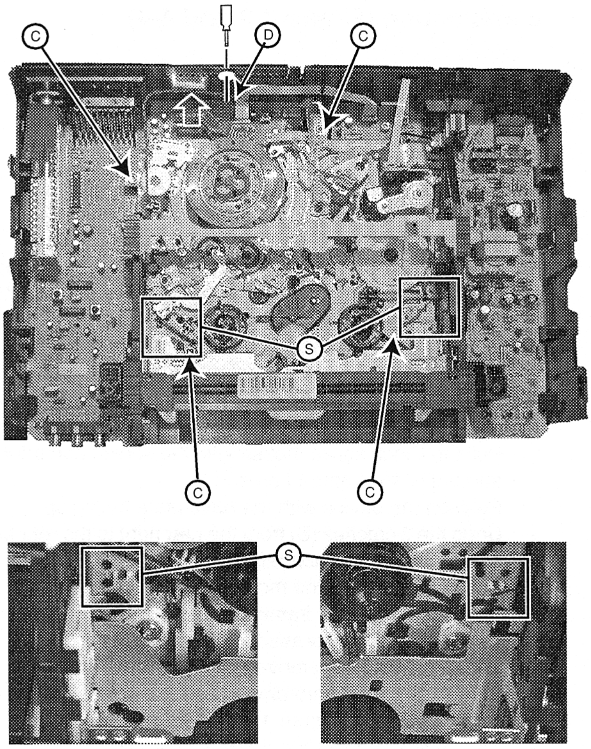
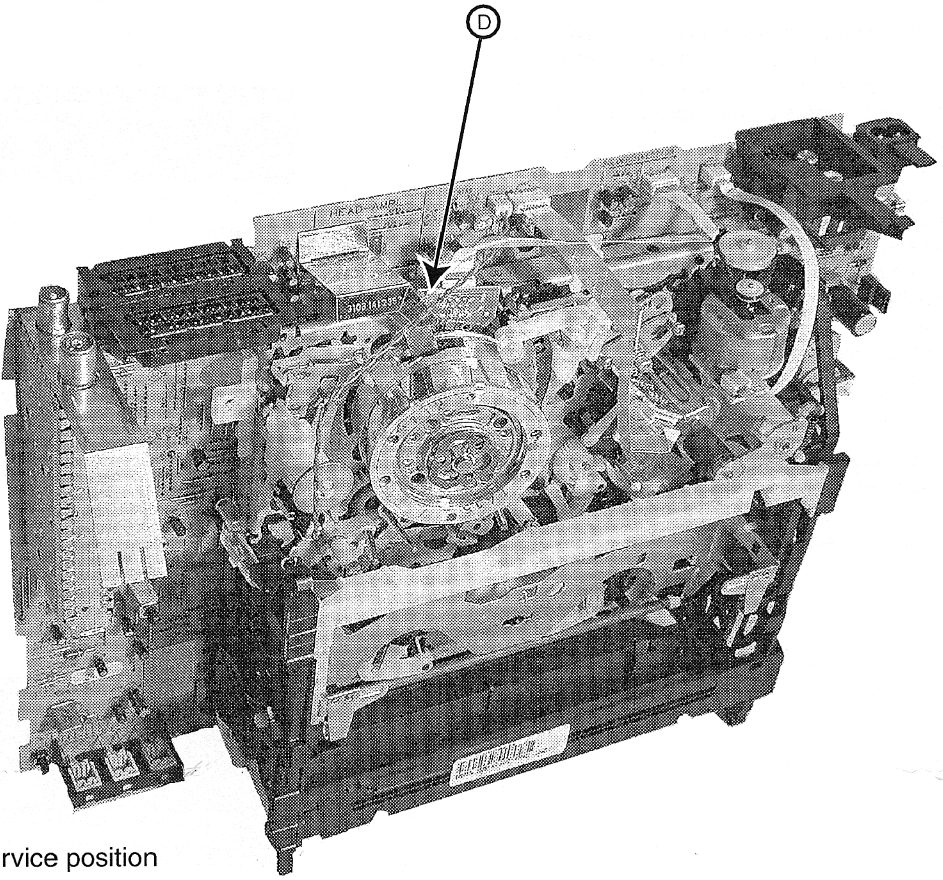


Figure 4-5



Service position

Figure 4-6

5. Service modes, Repair tips

5.1 Special functions

5.1.1 Erasing the EEPROM

- Disconnect from mains
- Push and hold down the Standby key, reconnect to mains and keep the Standby key depressed for a further 3 sec.

All EEPROM data will then be erased and initialised (timer and transmitter channels). The internal processor RAM will also be erased, but the option codes, deck parameters and adjustment values are maintained.

5.1.2 After changing the EEPROM or Motherboard the following steps must be carried out:

Step 40: Option code input
Step 51: Gap position adjustment
Step 52: Studio Picture control' adjustment
Step 53: Input of clock correction
Step 62: Adjustment of Audio Linear Playback Level
Step 99: Clock frequency output

5.2 Service test program

5.2.1 Introduction

The software program for the control, deck and operating microprocessors includes a service test program. It was divided into the following steps, with the following 'modes':

Step 00: Display of mask version number
Step 01: Check of the drive positions
Step 02: Display of the deck - error codes
Step 03: Deck - sensors and manual tracking
Step 04: Display of operating hours counter
Step 05: Display of the IIC-Bus Communication
Step 10: Operation without drive - dummy mode
Step 40: Option code input

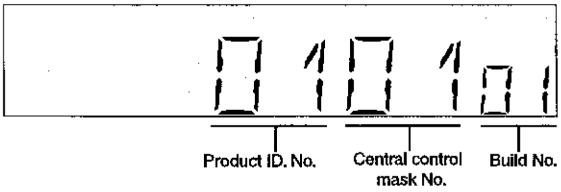
Adjustment Steps in the service test program:
Step 51: Gap position adjustment
Step 52: 'Studio Picture control' adjustment
Step 53: Input of clock correction
Step 62: Adjustment of Audio Linear Playback Level
Step 98: Display test
Step 99: Clock frequency output

In the service test program, all drive functions apart from the channel search and channel change mode can be carried out. The program position set before entering the service test program is maintained.

5.2.2 Activating the service test program

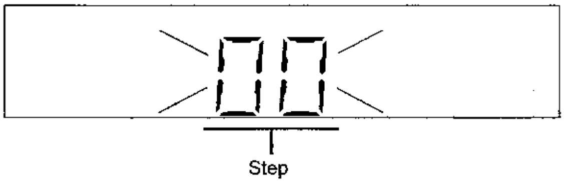
Press and hold down the STOP key on the remote control. Then press the PLAY key on the recorder and keep it depressed for at least 5 sec. The STOP key on the remote control may be released whilst the PLAY key on the recorder is pressed.
The service test program can be selected in any operating mode apart from the channel search, install, clock set-up and cassette length calculation mode. The recorder and all drive functions are fully operational in the service mode.

The display shows, for instance:

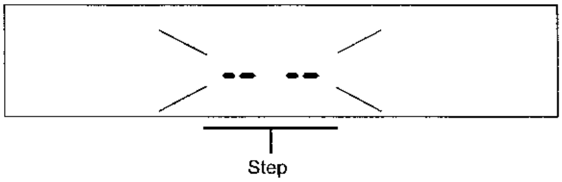


Prod. ID No.	ident. No. for A 13 (31, 32, 37)
Centr. Contr. Mask No.	µP mask No.
Build No.	continually state No.(software)

By pressing the SELECT key on the remote control, all step modes may be left and the currently selected step number appears and flashes.



Other service steps are selected with the UP and DOWN keys or the numerical remote control keys. By pressing the SELECT key on the remote control whilst the Step is flashing, the respective mode can be entered or left.
If a step is selected to which no mode is assigned, the displays shows - - and flashes.

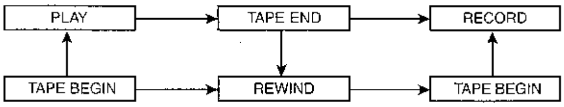


To leave the service program, press the STAND-BY key or disconnect recorder from mains.

5.2.3 Service mode functions

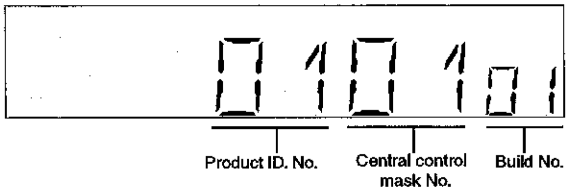
Endurance test
In the service test program, the recorder can be endurance tested. For this purpose, use a cassette and activate "PLAY" or "REC". The functions are then repeated continuously. In RECORD, the recorder does not move to EJECT at the tape end, but to REWIND, after which it starts to RECORD again. This test serves to detect intermittent faults. The last error is stored in the EEPROM. (The fault remains stored even after a power failure).

The endurance test is ended by pressing STOP or leaving the service test program.

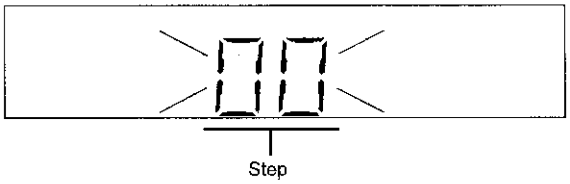


5.2.4 Description of steps with modes:

Step 00: Display of mask version number
After activating the service test program, step 00 and the mask version number are automatically displayed.



The mode can be left again by pressing the SELECT key on the remote control. The currently selected position number appears and flashes on the display.



A step between 00 and 99 can now be selected

Step 01: Checking the drive positions
By pressing the SELECT key whilst Step 01 is flashing, the drive position appears on the display.
The FTA signal from the photoelectric barriers which controls the revolutions of the loading motor is used to check the drive condition.
The drive position is shown as a 3-digit decimal number by counting the FTA pulses on the display.

(e.g. 213 = Play)

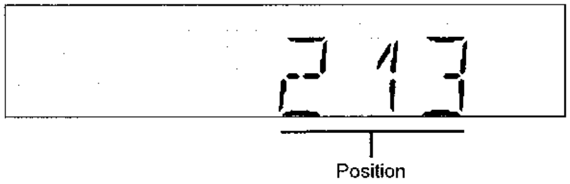
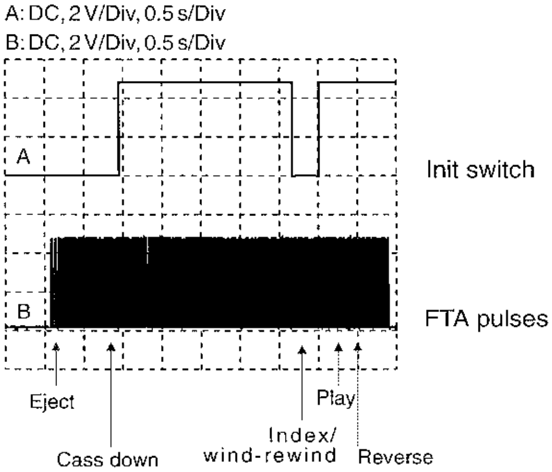


Table of drive positions:

Status	Position (FTA dec)
Eject	007 +2/-2
Index	191 +0/-2
Stop	200 +4/-4
Play	213 +4/-4
Reverse	237 +2/-0

Function of the Init switch:
The diagram shows the function of the Init switch, depending on the position of the deck. The number of FTA pulses is important for the position of the drive.



Step 02: Display of the deck error codes
By pressing the SELECT key whilst Step 02 is flashing, the deck error code is shown on the display.

Checking the drive function Loading and unloading time
The signal (FTA) of the photoelectric barrier which controls the revolutions of the loading motor is used as a reference for the loading and unloading time.

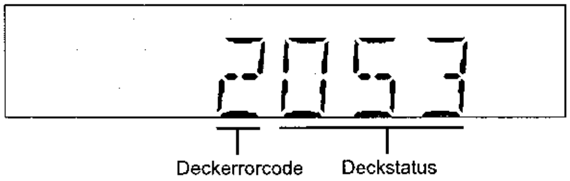
Stopping of supply or take-up reels
The tacho signals of the left (WTL) and right (WTR) winding disks are used as control reference.

Stopping of head drum motor
This is monitored with the PG/FG signal. The signal is discharged from the e.m.f. of the non-conducting spools of the head cylinder motor, showing the position of the head cylinder.

Capstan motor fault
This is monitored with the FGD signal.
If one of the above sensor signals is not available, the recorder tries to put the lift into the "EJECT" position.

Explanation of deck error codes and deck error status
The last error code is stored and remains in the EEPROM, even if the recorder is disconnected from the mains.
The error code can be erased by pushing the CLEAR button on the remote control.

The display shows, for instance:



The left digit shows the error:
(e.g.: Error 2 = Capstan error)

Error table:

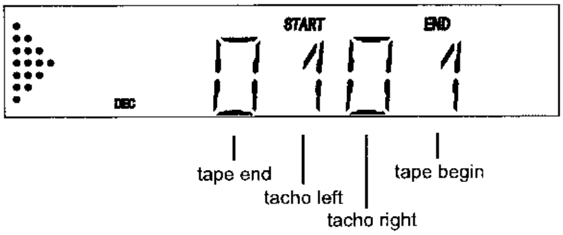
0	no error
1	threading error
2	no capstan pulses
3	tape broken
4	no pulses left reel
5	no pulses right reel
6	head motor error

The 3 digits on the right represent the deck error condition:
(e.g.: 053 = during Play)
The error code can be reset in this step with the CLEAR key.

Functiontable:

012	Standby	114	VISS write	211/491	Slowmotion 1/24
014	Autotracking	115	Viss erase	212/492	" " 1/14
031	Play-3	125	Tuner - Stopout	215/495	" " 1/7
034	Slow_reverse	126	Auto Remain Funct.	216/496	" " 1/2
041	Still Picture	130/410	ATTS Function	217/497	" " -1/24
042	Fast	168/448	Frame+	218/498	" " -1/14
044	Play-9	169/449	Frame-	219/499	" " -1/7
045	Eject	170/450	Play-11	220/500	" " -1/2
046	Play9	171/451	Play-7	222/502	Edit Record
047	Play-1	172/452	Play-5	223/503	Align of Gap
048	Pause	173/453	Play5	238/518	Pause
050	Rewind	174/454	Play7	239/519	SPC align
052	Wind	175/455	Play11	246/526	Edit Pause
053	Play	196/456	Tuner - Eject	247/527	Slow motion 1/10
054	Stop out	197/457	Standby Eject	248/528	" " 1/18
055	Record	199/459	Audio Dubbing	249/529	" " -1/10
112	Index next	202/482	Audio Dubb. Pause	250/530	" " -1/18
113	Index previous	206/486	Reset Tapecounter	253/533	Key Released

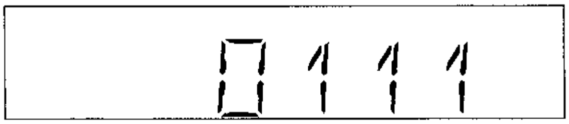
Step 03: Deck sensors and manual tracking
By pressing the SELECT key whilst step 03 is flashing, the deck sensors will be displayed in one digit as either 1 or 0.



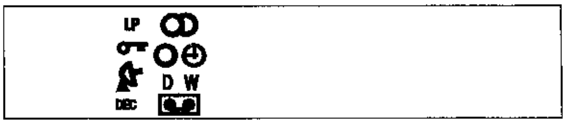
■ ● ◀ ▶	are used to display the deck status
START	init switch (INIT)
END	record protection (RECP)
DEC	Loading pulses (FTA)

In the service test program, the tracking is always in the centre position.
Only in this step can the value for the required tape running setting be changed, manually in the PLAY function with the UP / DOWN keys. After leaving the mode with the SELECT key, the tracking value always resets itself to the centre position and cannot be changed.

Step 04: Display of the operating hours counter:
By pressing the SELECT key whilst step 04 is flashing, the operating hours counter shows how many hours the head disk has turned. The hours are displayed as a 4-digit decimal number.



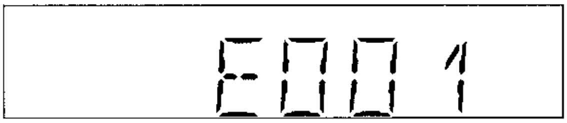
Step 05: Display of the IIC - Bus Communication:
By pressing the SELECT key whilst step 05 is flashing, the available IIC- components will be displayed with symbols.



Symbol	Description	Component	Position
▣	VPS or VPO IC	SDA5650 or SDA5652	7502
DEC	FM ST / NIC IC	MSP 3415D	7761
📡	FM St IC	TDA 9873	7760
W	Video switch IC	STV 6401	7904
D	FM Audio IC	TDA 9605H	7650
⊕	Tuner Philips	TP9xx	1701
O	Tuner Alps	TMRxx/TCBZ4	1701
⚷	Modulator Phil	TP9xx	1701
LP	Modulator Alps	TMRxx/TCBZ4	1701
∞	Signal electr. IC	LA71595M	7004

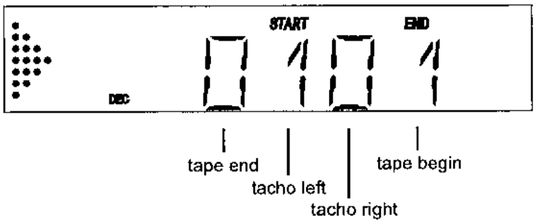
The following errors are visible in the display when the start up routine of the set isn't working properly.

E000	**IIC-Data** line is low
E001	**IIC-Clock** line is low
E002	**EEPROM** give no acknowledgement



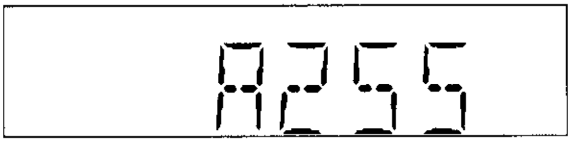
Step 10: Operation without drive - dummy mode
Before activating this mode with the SELECT key, the recorder must be in the EJECT position.

Enter the mode by pressing the SELECT key. The motors are then switched off and the sensors will be ignored by the deck microprocessor. The drive can now be dismantled from the motherboard (see dismantling instructions). **Only install drive if recorder is disconnected from mains.** For signal tracking, the recorder can be set to all drive conditions, i.e. signal electronics, audio and IO processing are switched to the respective operating mode.

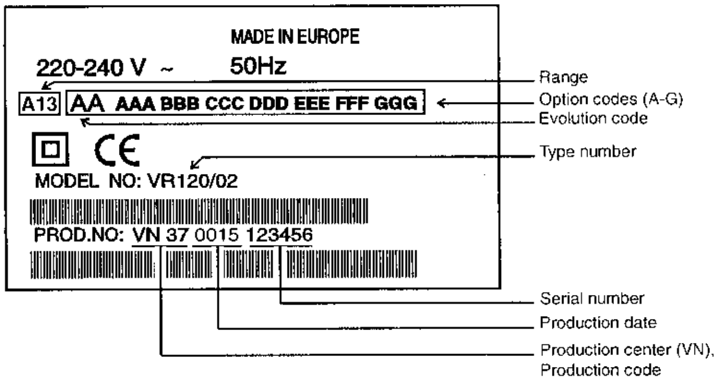

START
END
DEC
0101
tape end
tacho left
tacho right
tape begin

■ ● ◀ ▶	are used to display the deck status
START	init switch (INIT)
END	record protection (RECP)
DEC	Loading pulses (FTA)

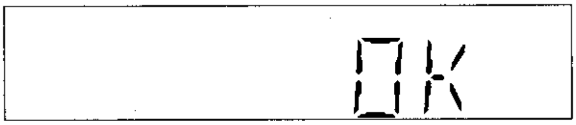
Step 40: Option code input
If a new EEPROM is installed in the course of repairs, it must be initialised.
By pressing the SELECT key whilst step 40 is flashing, the decimal option A appears in the display.



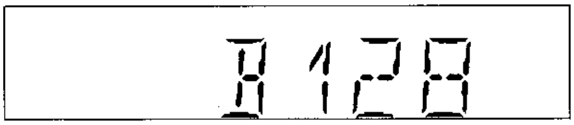
By entering a 3-digit decimal code, the correct features are set.


MADE IN EUROPE
220-240 V ~
50Hz
A13
AA AAA BBB CCC DDD EEE FFF GGG
CE
MODEL NO: VR120/02
PROD.NO: VN 37 0015 123456
Range
Option codes (A-G)
Evolution code
Type number
Serial number
Production date
Production center (VN),
Production code

These codes are shown on the type-plate of the recorder.
After pressing the OK key on the remote control, the entered code is saved. The display shows OK for approx. 3 sec. and then the stored value in decimal format.



By pressing the UP and DOWN keys, the available options (A to G) can be selected. The display shows the last stored value in decimal format.



In case of an invalid entry (value >255) the activation of the OK key causes the content of the last stored option to be displayed and OK does not appear in the display.

Depending on the model, some bits are software or default protected and cannot be changed by an entry. In this case, the display shows OK, but the display returns to the default value.

Step 98: Display Test
By pressing the SELECT key whilst step 98 is flashing, all segments of the display are illuminated.

The step is exited by pressing SELECT again.

5.3 Repair tips

5.3.1 Replacement procedure for leadless components (chip)

The following procedures are recommended for replacing leadless components used in this unit.

1. Preparation for replacement

a. Soldering iron
Use a pencil-type soldering iron that uses less than 30W
b. Solder
Use Eutectic solder (Tin 63%, Lead 37%)
c. Soldering time
Maximum 4 seconds.

Note:

- Leadless components must not be re-used after removal.
- Excessive mechanical stress and rubbing of the component electrode must be avoided.

2. Removing the leadless components

Grasp the leadless component body with tweezers and alternately apply heat to both electrodes. When the solder on both electrodes has melted, remove leadless component with a twisting motion.

Note:

- Do not attempt to lift the component off the board until the component is completely disconnected from the board with a twisting motion.
- Be careful not to break the copper foil on the printed circuit board.

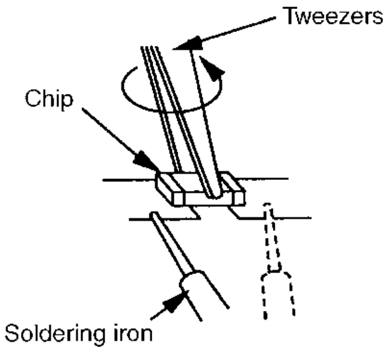
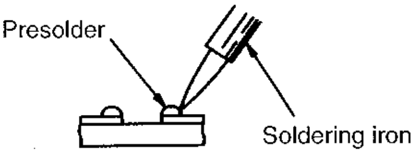


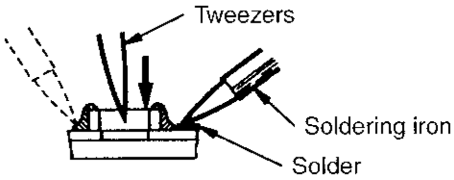
Figure 5-1

3. Installation of leadless components

a. Presolder the contact points on the circuit board



b. Using tweezers press down the part and solder both electrodes as shown below.



Note:
Do not glue the replacement component to the circuit board.

5.3.2 How to remove/install the Flat Pack IC

How to remove the Flat Pack IC

- **Using a hot air Flat Pack IC unsoldering equipment**

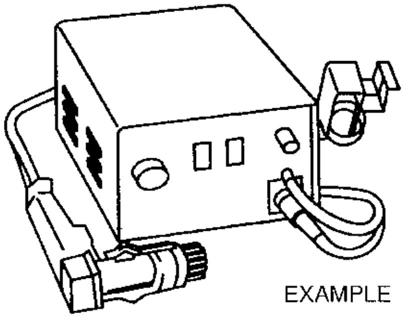


Figure 5-2

a. Prepare the hot air Flat Pack IC unsoldering equipment. Then apply hot air to Flat Pack IC for 5 - 8 seconds.

b. Remove the Flat Pack IC with tweezers while applying the hot air.

CAUTION:
To avoid damage, do not apply the hot air to the chip parts around the Flat Pack IC for long periods.

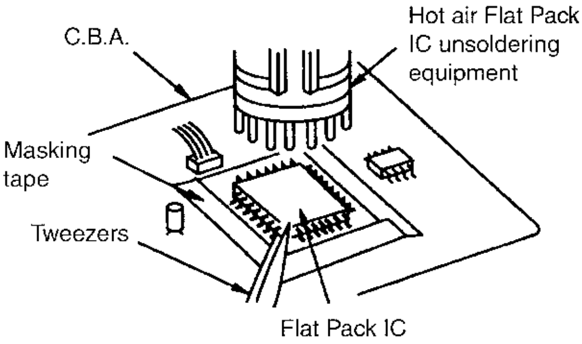


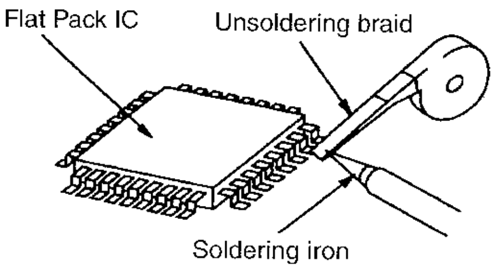
Figure 5-3

Put masking tape around the Flat Pack IC to protect adjacent parts.

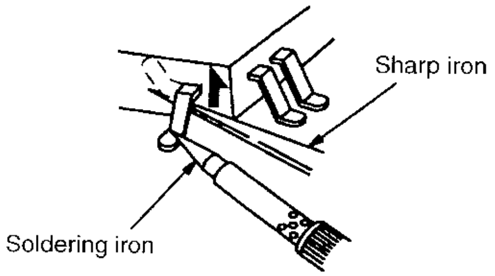
The Flat Pack IC is fixed to the P.C.B. with glue; therefore take care not to break or damage any foil under the IC or on each pin when removing it.

- **Using a soldering iron**

a. Use unsoldering braid to remove the solder from all pins of the Flat Pack IC. Apply solder flux to all pins of the Flat Pack IC, to allow easy removal.


Flat Pack IC
Unsoldering braid
Soldering iron

b. Lift up each lead of the Flat Pack IC individually, using a sharp pin or non-solder wire (iron wire), while heating the pins using a fine tip soldering iron or a hot air blower.


Sharp iron
Soldering iron

- **Using iron wire**

a. Use unsoldering braid to remove the solder from all pins of the Flat Pack IC. Apply solder flux to all pins of the Flat Pack IC, to allow easy removal.

b. Affix the wire to workbench or solid mounting point (see figure 5-3)

c. Pull up the wire as the solder melts in order to lift the IC lead from the P.C.B. contact pad, while heating the pins using a fine-tip soldering iron or hot air blower.

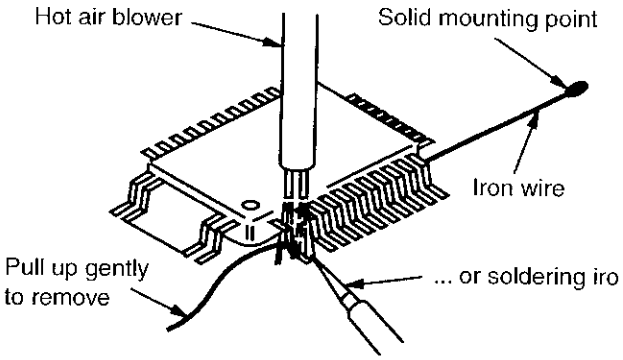

Hot air blower
Solid mounting point
Iron wire
Pull up gently
to remove
... or soldering iro

Figure 5-4

Note:
When using a soldering iron care must be taken to ensure that the Flat Pack IC is not held by glue or the P.C.B. may be damaged if force is used.
If the IC is glued, heat the IC with hot air to loosen the glue.

- **Using a special removal device**

a. Apply extra tin-lead solder onto the pins

b. Heat the IC to melt the glue which has been used to affix it

c. Use a solder removing device with a special punch which matches the contours of the IC to remove the IC.

At the other corners there are printed conductors which may be damaged!

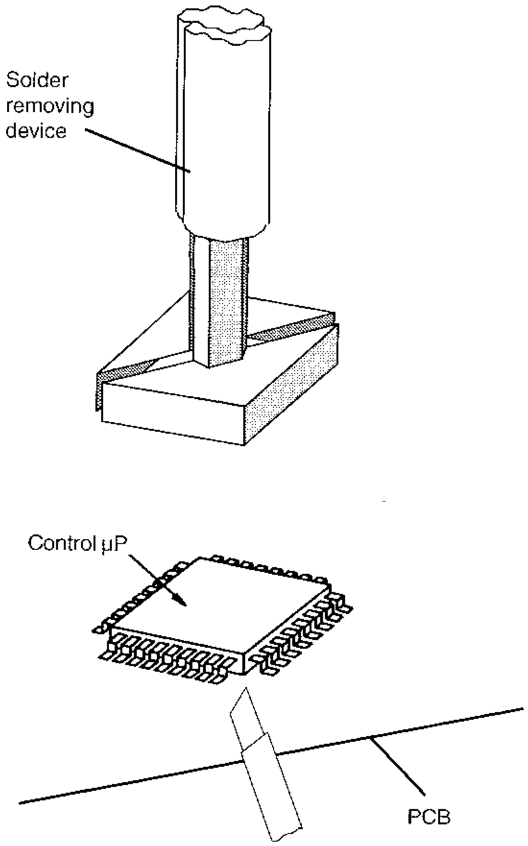

Solder
removing
device
Control µP
PCB

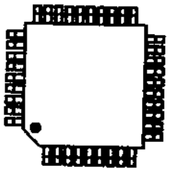
Figure 5-5

How to install the Flat Pack IC

a. Use unsoldering braid to remove the solder from the foil of each pin of the Flat Pack IC on the P.C.B. in order to install the replacement Flat Pack IC more easily.

b. The "dot" mark on the Flat Pack IC indicates pin 1. Make sure this mark matches the 1 on the P.C.B. when positioning for installation. Then pre-solder the four corners of the d. Flat Pack IC. (see figure 5-5).

Example



Pin 1 on Flat Pack IC is market by a "●".

Figure 5-6

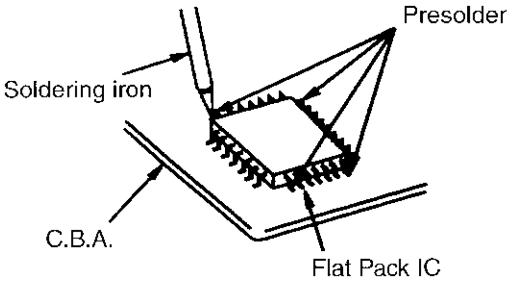

Presolder
Soldering iron
C.B.A.
Flat Pack IC

Figure 5-7

c. Solder all pins of the Flat Pack IC. Make sure that none of the pins have solder bridges between pins on the Flat Pack IC.

5.4 Note

All integrated circuits and many other semiconductor devices are electrostatically sensitive and therefore require the special handling techniques described in the "SAFETY INSTRUCTIONS" section of this manual.

5.5 Voltage measurements

Color bar signal in SP REC and PB modes.

Note:
Voltage indications for the REC. and PB mode on the schematic diagrams are shown below:

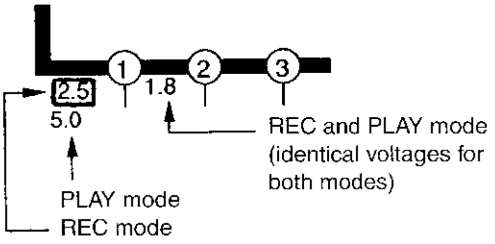

①
②
③
2.5
1.8
5.0
REC and PLAY mode (identical voltages for both modes)
PLAY mode
REC mode

Figure 5-8

5.6 How to read wave forms

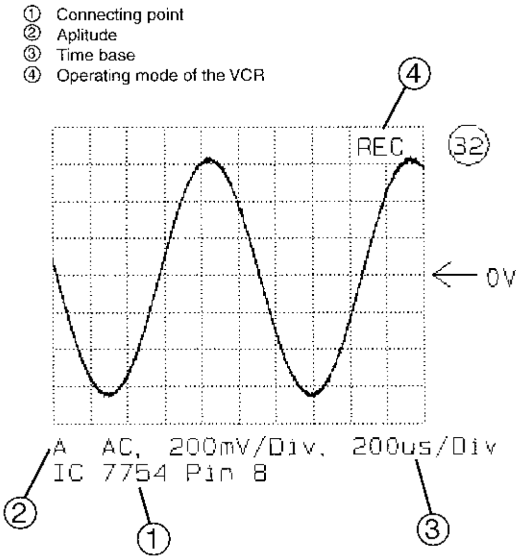


Figure 5-9

5.7 Voltage indication of Zener diodes

The Zener voltage of Zener diodes is indicated as such on schematic diagrams:
Example: BZX79C20............Zener voltage: 20 Volts

5.8 How to identify connectors on schematic diagrams

Each connector is labeled with a connector number and a pin number indicating to what component it is connected; in other words, its counterpart.

Use the Connecting Wiring Diagram to find the connections between associated connectors.

Example:
The connections between C.B.A.s are shown below:

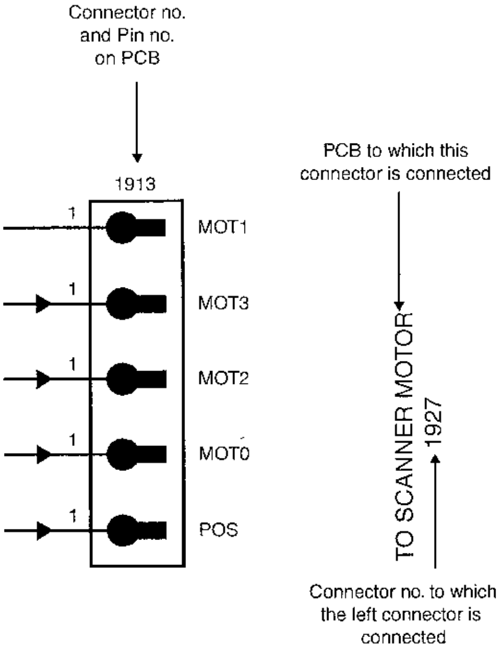
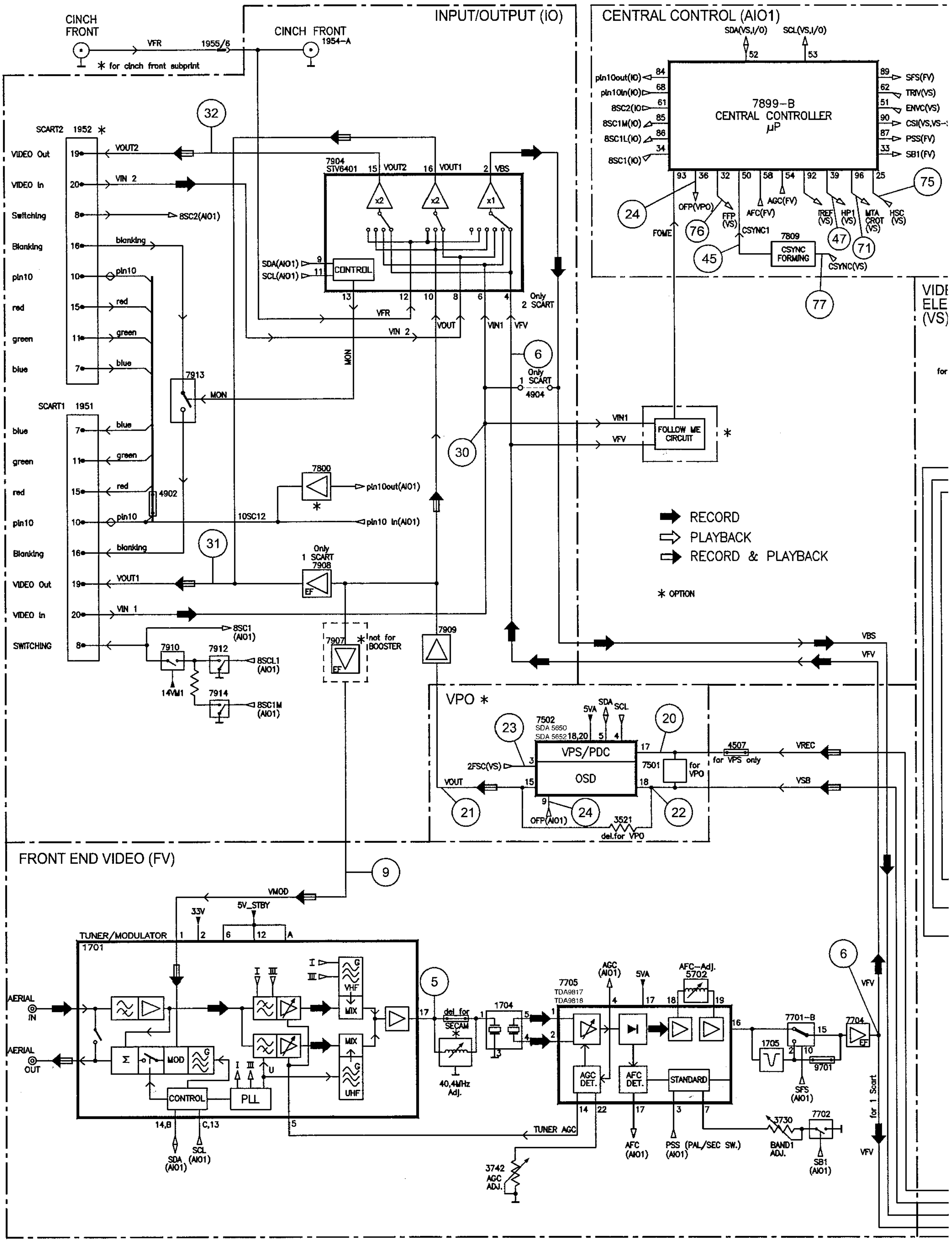

Connector no. and Pin no. on PCB
PCB to which this connector is connected
1913
1
MOT1
1
MOT3
1
MOT2
1
MOTO
1
POS
TO SCANNER MOTOR
1927
Connector no. to which the left connector is connected

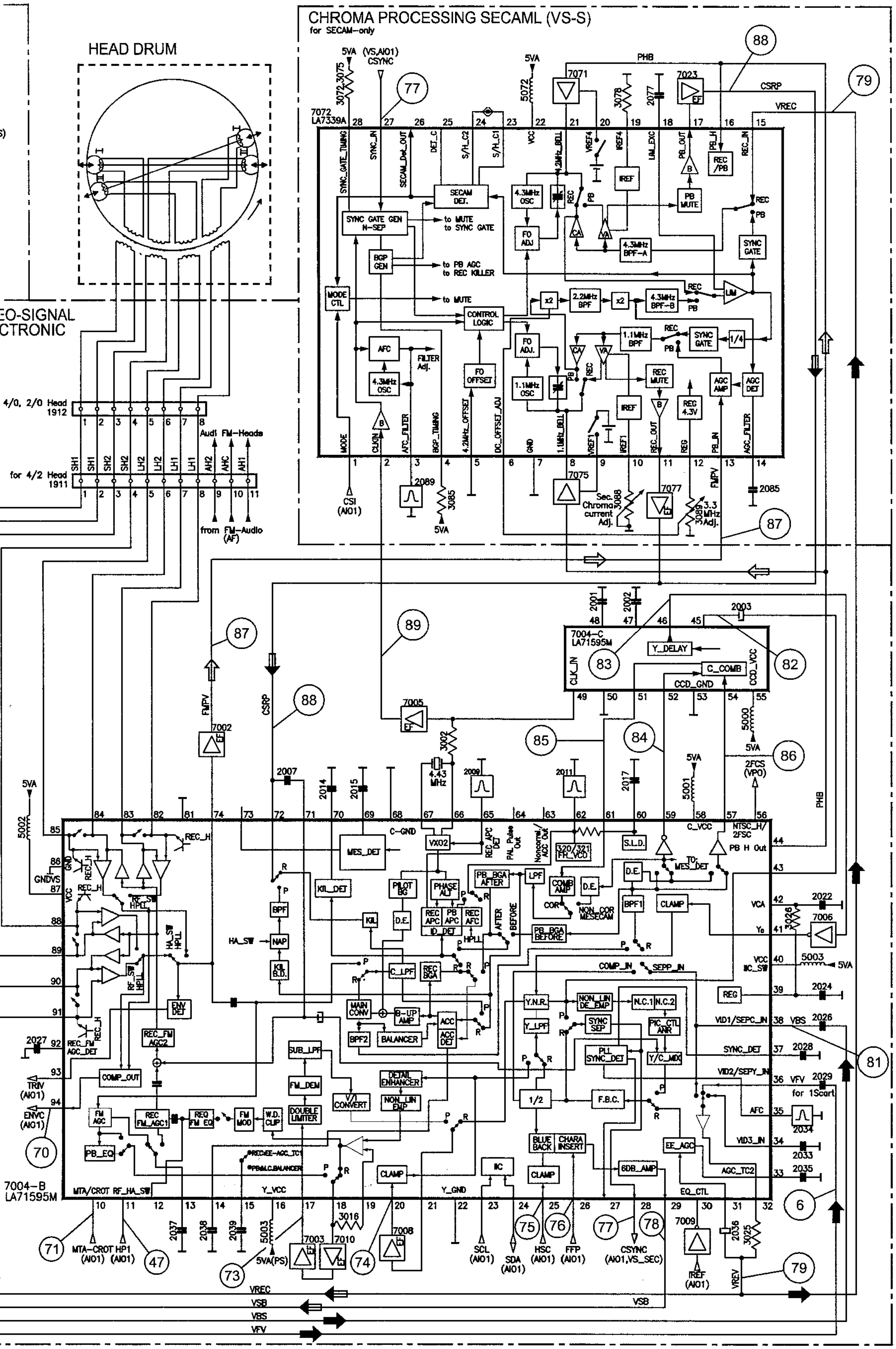
Figure 5-10

Engineer's remarks:

6. Block diagrams, Waveforms

6.1 Block diagram Video

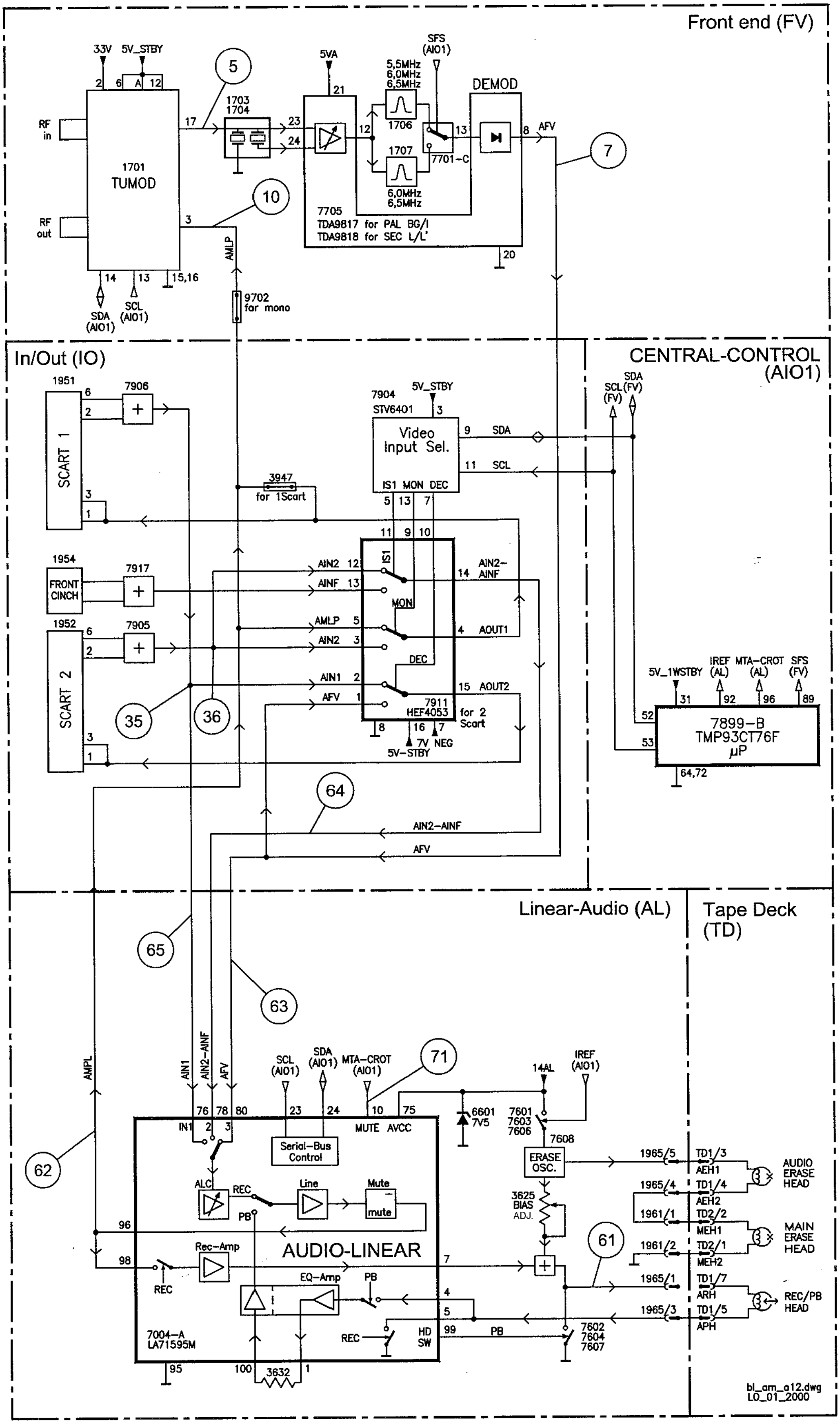

CINCH FRONT
VFR
1955/6
* for cinch front subprint
INPUT/OUTPUT (IO)
CINCH FRONT
1954-A
CENTRAL CONTROL (AIO1)
SCART2 1952 *
VIDEO Out
VIDEO In
Switching
Blanking
pin10
red
green
blue
VOUT2
VIN 2
8SC2(AIO1)
blanking
7904
STV6401
VOUT1
VBS
x2
x2
x1
SDA(AIO1)
SCL(AIO1)
CONTROL
MON
VFR
VIN 2
VOUT
VIN1
VFV
Only 2 SCART
Only 1 SCART
4904
7913
SCART1 1951
4902
7800
pin10out(AIO1)
pin10 in(AIO1)
10SC12
Only 1 SCART
7908
EF
VOUT1
VIN 1
SWITCHING
8SC1 (AIO1)
7910
7912
8SCL1 (AIO1)
14VM1
7914
8SC1M (AIO1)
7907
EF
*not for BOOSTER
7909
7899-B
CENTRAL CONTROLLER
µP
SDA(VS,I/O)
SCL(VS,I/O)
pin10out(IO)
pin10in(IO)
8SC2(IO)
8SC1M(IO)
8SC1L(IO)
8SC1(IO)
SFS(FV)
TRIV(VS)
ENVC(VS)
CSI(VS,VS-
PSS(FV)
SB1(FV)
OFP(VPO)
FFP (VS)
AFC(FV)
AGC(FV)
IREF (VS)
HP1 (VS)
MTA CROT (VS)
HSC (VS)
FOWE
CSYNC1
7809
CSYNC FORMING
CSYNC(VS)
VIDE
ELE
(VS)
FOLLOW ME CIRCUIT
VIN1
VFV
RECORD
PLAYBACK
RECORD & PLAYBACK
* OPTION
VBS
VFV
VPO *
7502
SDA 5650
SDA 5652
5VA
SDA
SCL
VPS/PDC
OSD
2FSC(VS)
VOUT
7501
for VPO
4507
for VPS only
VREC
VSB
OFP(AIO1)
3521
del.for VPO
FRONT END VIDEO (FV)
VMOD
33V
5V_STBY
TUNER/MODULATOR
1701
AERIAL IN
AERIAL OUT
MOD
CONTROL
PLL
VHF
MIX
UHF
SDA (AIO1)
SCL (AIO1)
del. for SECAM
40,4MHz Adj.
1704
7705
TDA9817
TDA9818
AGC (AIO1)
5VA
AFC-Adj.
5702
AGC DET.
AFC DET.
STANDARD
TUNER AGC
3742
AGC ADJ.
AFC (AIO1)
PSS (PAL/SEC SW.) (AIO1)
3730
BAND1 ADJ.
7702
SB1 (AIO1)
7701-B
1705
9701
SFS (AIO1)
7704
EF
VFV
for 1 Scart
VFV
32
24
76
75
47
71
45
77
6
30
31
23
20
21
24
22
9
5
6


CHROMA PROCESSING SECAML (VS-S)
for SECAM-only
HEAD DRUM
EO-SIGNAL
CTRONIC
7072
LA7339A
5VA
(VS,AIO1) CSYNC
3072,3075
77
88
79
PHB
CSRP
VREC
7071
7023
5072
3078
2077
SYNC_GATE_TIMING
SYNC_IN
SECAM_Det_OUT
DET_C
S/H_C2
S/H_C1
VCC
2MHz_BELL
VREF4
IREF4
LIM_EXC
PB_OUT
PB_H
REC_IN
SECAM DET.
SYNC GATE GEN N-SEP
to MUTE
to SYNC GATE
BGP GEN
to PB AGC
to REC KILLER
MODE CTL
to MUTE
CONTROL LOGIC
AFC
4.3MHz OSC
FILTER Adj.
F0 OFFSET
F0 ADJ
4.3MHz OSC
4.3MHz BPF-A
2.2MHz BPF
x2
4.3MHz BPF-B
LIM
SYNC GATE
REC /PB
PB MUTE
1.1MHz BPF
1/4
F0 ADJ.
1.1MHz OSC
REC MUTE
IREF
REG 4.3V
AGC AMP
AGC DET
MODE
CLKIN
AFC_FILTER
BGP_TIMING
4.2MHz_OFFSET
DC_OFFSET_ADJ
GND
1.1MHz_BELL
VREF1
IREF1
REC_OUT
REG
PB_IN
AGC_FILTER
CSI (AIO1)
2089
3085
5VA
7075
Sec. Chroma current Adj.
3088
7077
3089
3.3 MHz Adj.
FMPV
2085
87
4/0, 2/0 Head 1912
for 4/2 Head 1911
SH1
SH2
LH2
LH1
AH2
AHC
AH1
Audi FM-Heads
from FM-Audio (AF)
87
FMPV
7002
89
88
CSRP
7005
3002
4.43 MHz
7004-C
LA71595M
2001
2002
2003
Y_DELAY
C_COMB
CCD_GND
CLK_IN
CCD_VCC
83
82
85
84
86
5000
5VA
2FCS (VPO)
PHB
2007
2014
2015
2009
2011
2017
5VA
5001
5VA
5002
GNDVS
MES_DET
C-GND
VXO2
REC APC DET
PAL Pulse Out
Noncorrel/ACC Out
320/321 FH_VCO
S.L.D.
C_VCC
NTSC_H/ 2FSC
PB H Out
TO MES_DET
REC_H
RF_SW
HPLL
HA_SW
KIL_DET
PILOT BG
PHASE ALT
PB_BGA AFTER
LPF
COMB AMP
D.E.
COR
NON_COR MESECAM
BPF1
CLAMP
BPF
NAP
KIL
KIL B.D.
REC APC
PB APC
REC AFC
PB AFC
ID_DET
AFTER
BEFORE
PB_BGA BEFORE
C_LPF
REC BGA
COMP_IN
SEPP_IN
VCA
Yo
VCC
IIC_SW
5003
5VA
2022
7006
3026
REG
2024
ENV DET
MAIN CONV
B-UP AMP
BPF2
BALANCER
ACC
ACC DET
Y.N.R.
NON_LIN DE_EMP
N.C.1
N.C.2
Y_LPF
SYNC SEP
PIC_CTL ANR
PLL SYNC_DET
Y/C_MIX
VID1/SEPC_IN
VBS
2026
SYNC_DET
2028
VID2/SEPY_IN
VFV
2029
for 1Scart
AFC
2034
VID3_IN
2033
AGC_TC2
2035
81
2027
REC_FM AGC_DET
REC_FM AGC2
COMP_OUT
SUB_LPF
FM_DEM
DOUBLE LIMITER
V/I CONVERT
DETAIL ENHANCER
NON_LIN EMP
1/2
F.B.C.
BLUE BACK
CHARA INSERT
EE_AGC
TRIV (AIO1)
ENVC (AIO1)
70
FM AGC
REC FM_AGC1
REQ FM EQ
FM MOD
W.D. CLIP
PB_EQ
REC/EE-AGC_TC1
PB&LC.BALANCER
CLAMP
IIC
CLAMP
6DB_AMP
6
7004-B
LA71595M
MTA/CROT
RF_HA_SW
Y_VCC
Y_GND
EQ_CTL
71
MTA-CROT (AIO1)
HP1 (AIO1)
47
2037
2038
2039
5003
5VA(PS)
73
7003
7010
3016
74
7008
SCL (AIO1)
SDA (AIO1)
75
HSC (AIO1)
76
FFP (AIO1)
77
CSYNC (AIO1,VS_SEC)
78
7009
IREF (AIO1)
2036
3025
79
VREV
VREC
VSB
VBS
VFV
VSB

Interconnections:

AF page 73
AL page 72
AIO1 page 66
AIO2 page 65
DE page 67
FM ST page 70
FM NIC-page 71
FV page 69
FOME page 78
I/O page 77
PS page 64
VPO page 76
VS page 75
VS_S page 74

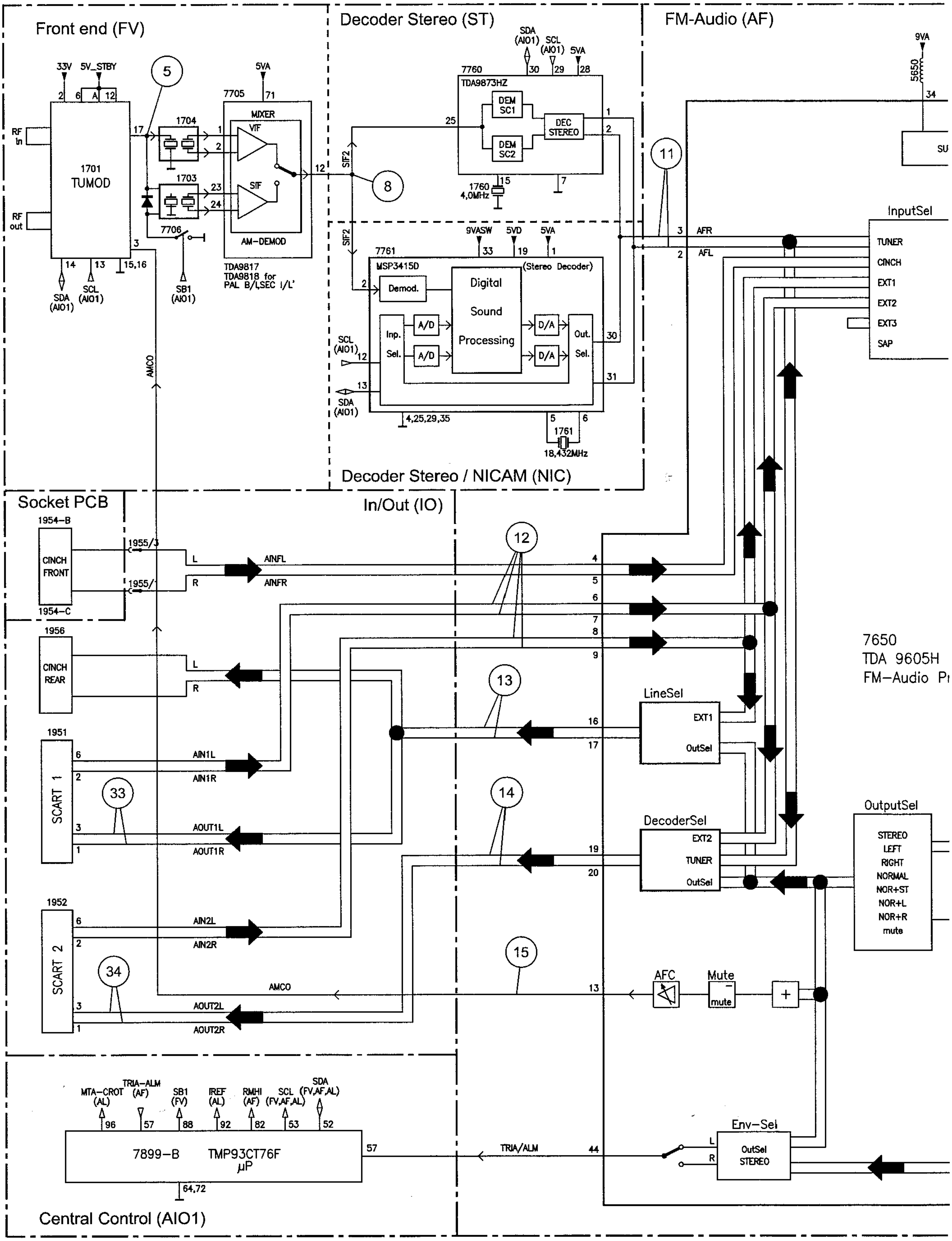
6.2 Block diagram Audio Mono

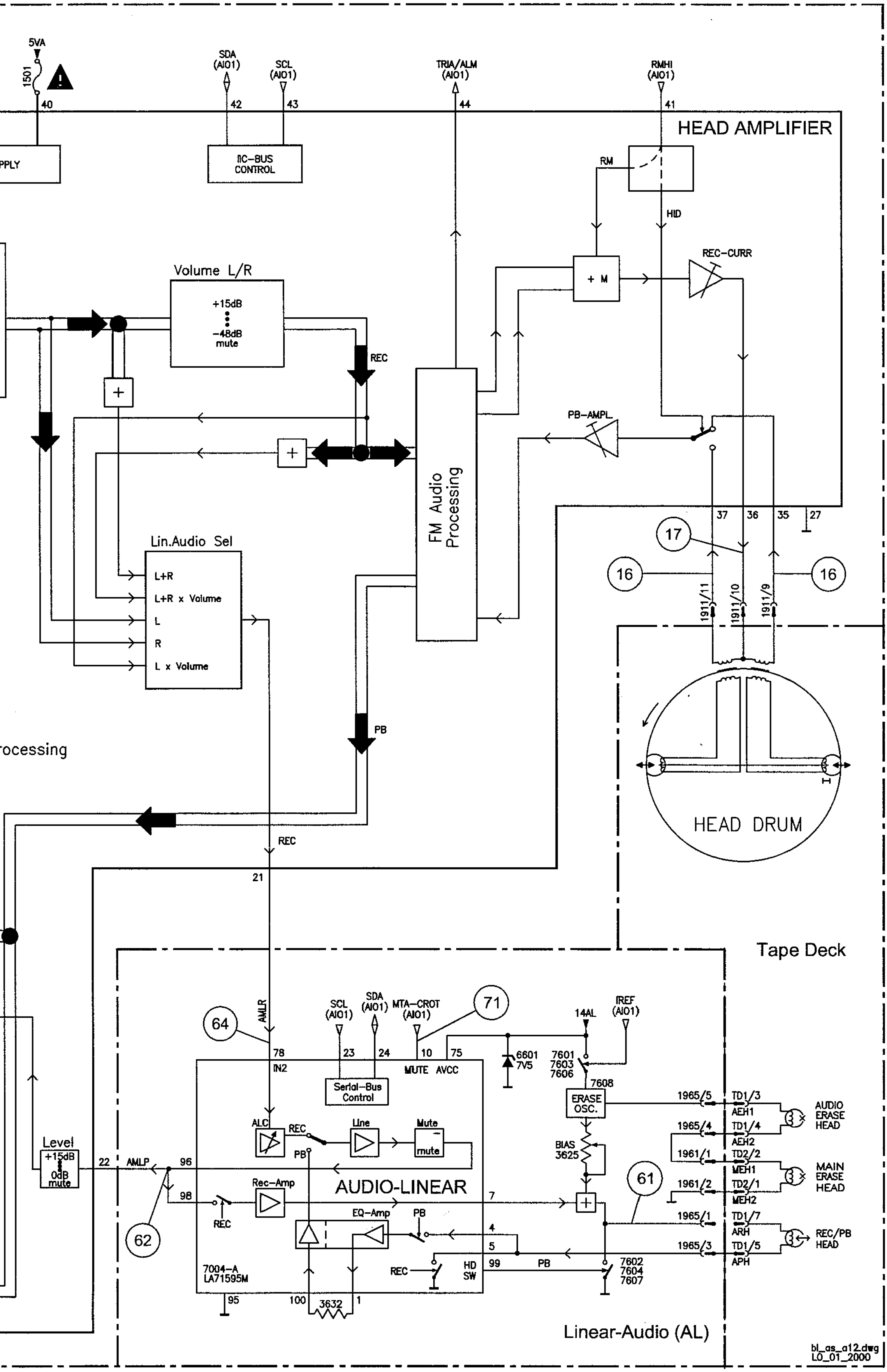

Front end (FV)
33V
5V_STBY
2
6
A
12
RF in
RF out
1701
TUMOD
17
3
14
13
15,16
SDA (AIO1)
SCL (AIO1)
5
10
1703
1704
AMLP
9702 for mono
5VA
21
23
24
12
5,5MHz
6,0MHz
6,5MHz
1706
1707
6,0MHz
6,5MHz
SFS (AIO1)
7701-C
13
DEMOD
8
AFV
7
7705
TDA9817 for PAL BG/I
TDA9818 for SEC L/L'
20
In/Out (IO)
CENTRAL-CONTROL (AIO1)
1951
SCART 1
6
2
3
1
7906
7904
STV6401
5V_STBY
3
Video Input Sel.
9 SDA
11 SCL
IS1 MON DEC
5 13 7
SDA
SCL (FV)
(FV)
3947
for 1Scart
11 9 10
1954
FRONT CINCH
7917
1952
SCART 2
7905
AIN2 12
AINF 13
IS1
MON
AMLP 5
AIN2 3
DEC
AIN1 2
AFV 1
14 AIN2–AINF
4 AOUT1
15 AOUT2
7911
HEF4053
for 2 Scart
8
16
7
7V NEG
5V–STBY
35
36
5V_1WSTBY
IREF (AL)
MTA-CROT (AL)
SFS (FV)
31
92
96
89
52
53
7899-B
TMP93CT76F
µP
64,72
64
AIN2–AINF
AFV
Linear-Audio (AL)
Tape Deck (TD)
65
63
62
AMPL
AIN1
AIN2–AINF
AFV
SCL (AIO1)
SDA (AIO1)
MTA-CROT (AIO1)
71
76
78
80
23
24
10
75
IN1
2
3
Serial-Bus Control
MUTE
AVCC
ALC
REC
Line
Mute
mute
PB
96
98
REC
Rec-Amp
AUDIO-LINEAR
EQ-Amp
PB
7
4
5
REC
HD SW
99
PB
7004-A
LA71595M
95
100
3632
1
6601
7V5
7601
7603
7606
14AL
IREF (AIO1)
7608
ERASE OSC.
3625 BIAS ADJ.
61
7602
7604
7607
1965/5
1965/4
1961/1
1961/2
1965/1
1965/3
TD1/3
AEH1
TD1/4
AEH2
TD2/2
MEH1
TD2/1
MEH2
TD1/7
ARH
TD1/5
APH
AUDIO ERASE HEAD
MAIN ERASE HEAD
REC/PB HEAD
bl_am_a12.dwg
L0_01_2000

Interconnections:

AF page 73
AL page 72
AIO1 page 66
AIO2 page 65
DE page 67
FM ST page 70
FM NIC-page 71
FV page 69
FOME page 78
I/O page 77
PS page 64
VPO page 76
VS page 75
VS_S page 74

6.3 Block diagram Audio Stereo

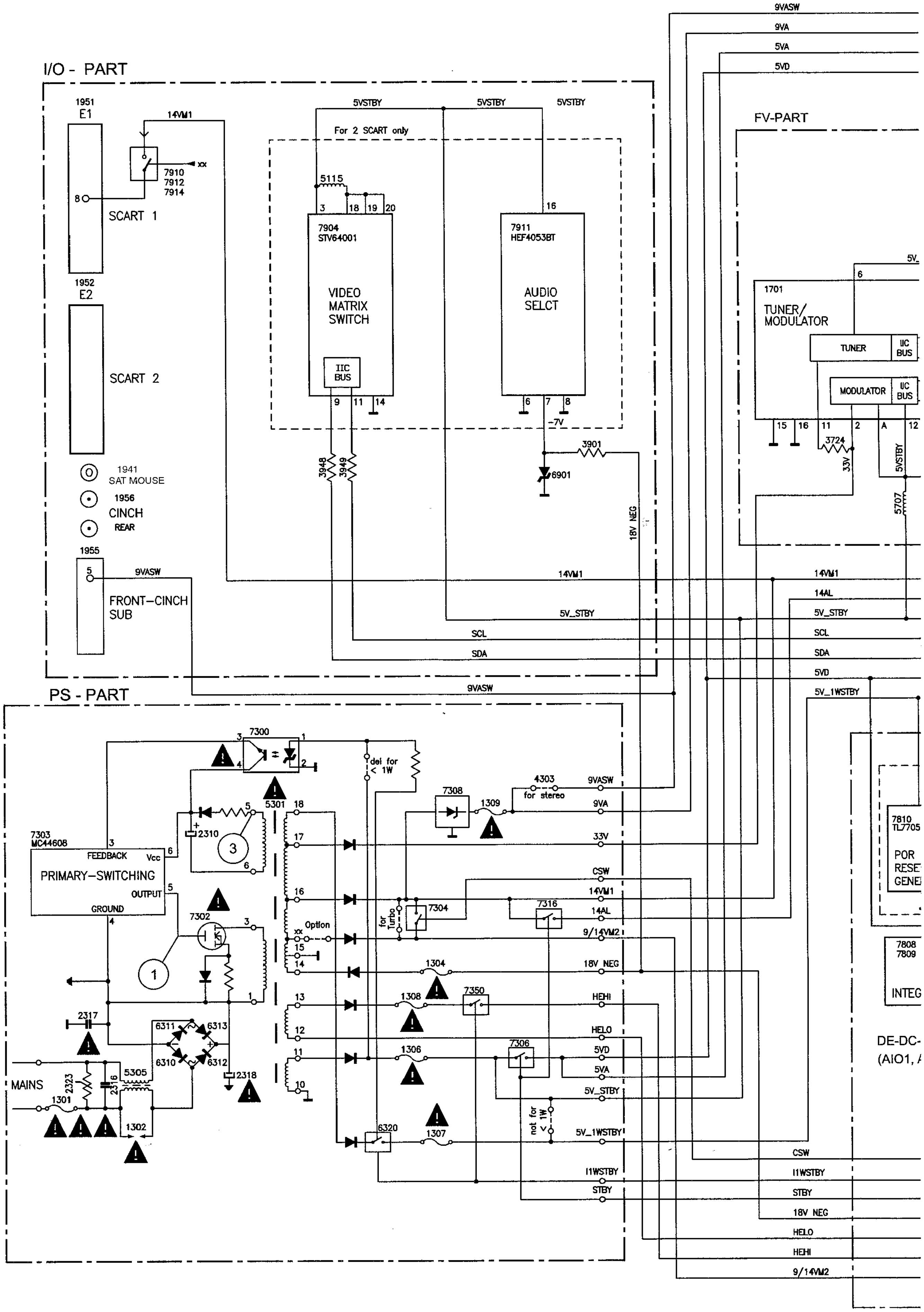

Front end (FV)
33V
5V_STBY
2
6
A
12
RF in
RF out
1701
TUMOD
17
3
14
13
15,16
SDA (AIO1)
SCL (AIO1)
5
1704
1703
1
2
23
24
7706
SB1 (AIO1)
7705
5VA
71
MIXER
VIF
SIF
AM-DEMOD
12
TDA9817
TDA9818 for PAL B/LSEC I/L'
AMCO
Decoder Stereo (ST)
SIF2
8
SDA (AIO1)
SCL (AIO1)
5VA
30
29
28
7760
TDA9873HZ
25
DEM SC1
DEM SC2
DEC STEREO
1
2
15
7
1760 4,0MHz
9VASW
5VD
5VA
33
19
1
7761
MSP3415D
(Stereo Decoder)
Demod.
Digital Sound Processing
Inp. Sel.
A/D
D/A
Out. Sel.
30
31
SCL (AIO1)
12
13
SDA (AIO1)
4,25,29,35
5
6
1761
18,432MHz
Decoder Stereo / NICAM (NIC)
FM-Audio (AF)
9VA
5650
34
SU
11
3
2
AFR
AFL
InputSel
TUNER
CINCH
EXT1
EXT2
EXT3
SAP
Socket PCB
1954-B
CINCH FRONT
1954-C
1955/3
1955/1
In/Out (IO)
L
R
AINFL
AINFR
12
4
5
6
7
8
9
1956
CINCH REAR
L
R
13
16
17
LineSel
EXT1
OutSel
7650
TDA 9605H
FM-Audio Pr
1951
SCART 1
6
2
3
1
AIN1L
AIN1R
33
AOUT1L
AOUT1R
14
19
20
DecoderSel
EXT2
TUNER
OutSel
OutputSel
STEREO
LEFT
RIGHT
NORMAL
NOR+ST
NOR+L
NOR+R
mute
1952
SCART 2
6
2
3
1
AIN2L
AIN2R
34
AOUT2L
AOUT2R
15
AMCO
13
AFC
Mute
mute
+
MTA-CROT (AL)
TRIA-ALM (AF)
SB1 (FV)
IREF (AL)
RMHI (AF)
SCL (FV,AF,AL)
SDA (FV,AF,AL)
96
57
88
92
82
53
52
7899-B TMP93CT76F µP
57
64,72
TRIA/ALM
44
Env-Sel
L
R
OutSel STEREO
Central Control (AIO1)

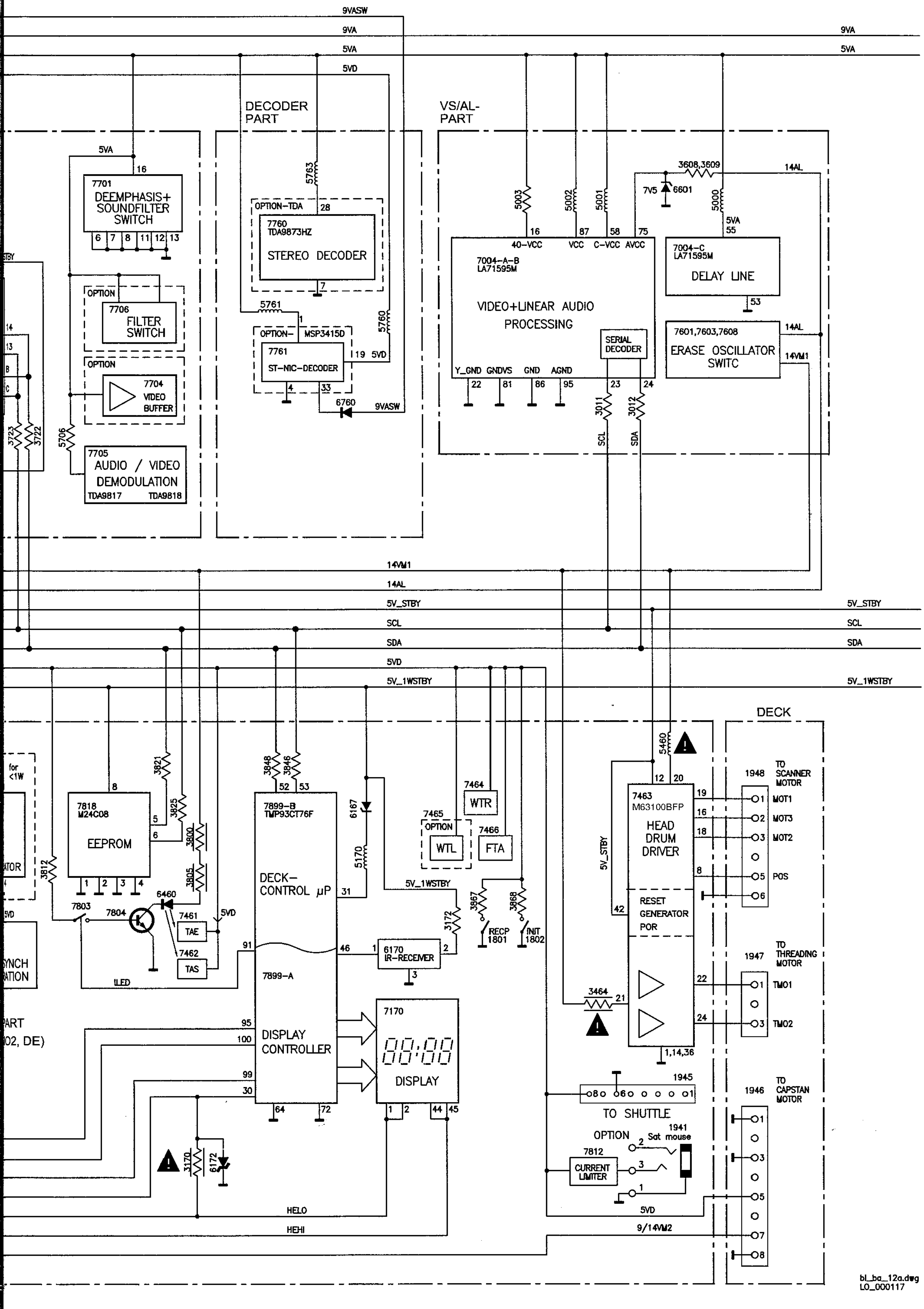

5VA
1501
40
PPLY
SDA (AIO1)
42
SCL (AIO1)
43
IIC-BUS CONTROL
TRIA/ALM (AIO1)
44
RMHI (AIO1)
41
HEAD AMPLIFIER
RM
HID
+ M
REC-CURR
Volume L/R
+15dB
-48dB
mute
REC
+
+
FM Audio Processing
PB-AMPL
37
36
35
27
17
16
16
1911/11
1911/10
1911/9
Lin.Audio Sel
L+R
L+R x Volume
L
R
L x Volume
PB
rocessing
HEAD DRUM
REC
21
Tape Deck
64
AMLR
78
IN2
SCL (AIO1)
SDA (AIO1)
MTA-CROT (AIO1)
71
23
24
10
75
MUTE
AVCC
Serial-Bus Control
14AL
IREF (AIO1)
6601 7V5
7601 7603 7606
7608
ERASE OSC.
BIAS 3625
ALC
REC
PB
Line
Mute
mute
Level
+15dB
0dB
mute
22
AMLP
96
98
62
REC
Rec-Amp
AUDIO-LINEAR
7
EQ-Amp
PB
4
5
REC
HD SW
99
PB
7602 7604 7607
7004-A LA71595M
95
100
3632
1
61
1965/5
1965/4
1961/1
1961/2
1965/1
1965/3
TD1/3
AEH1
TD1/4
AEH2
TD2/2
MEH1
TD2/1
MEH2
TD1/7
ARH
TD1/5
APH
AUDIO ERASE HEAD
MAIN ERASE HEAD
REC/PB HEAD
Linear-Audio (AL)
bl_as_a12.dwg
LO_01_2000

Interconnections:

AF page 73
AL page 72
AIO1 page 66
AIO2 page 65
DE page 67
FM ST page 70
FM NIC-page 71
FV page 69
FOME page 78
I/O page 77
PS page 64
VPO page 76
VS page 75
VS_S page 74

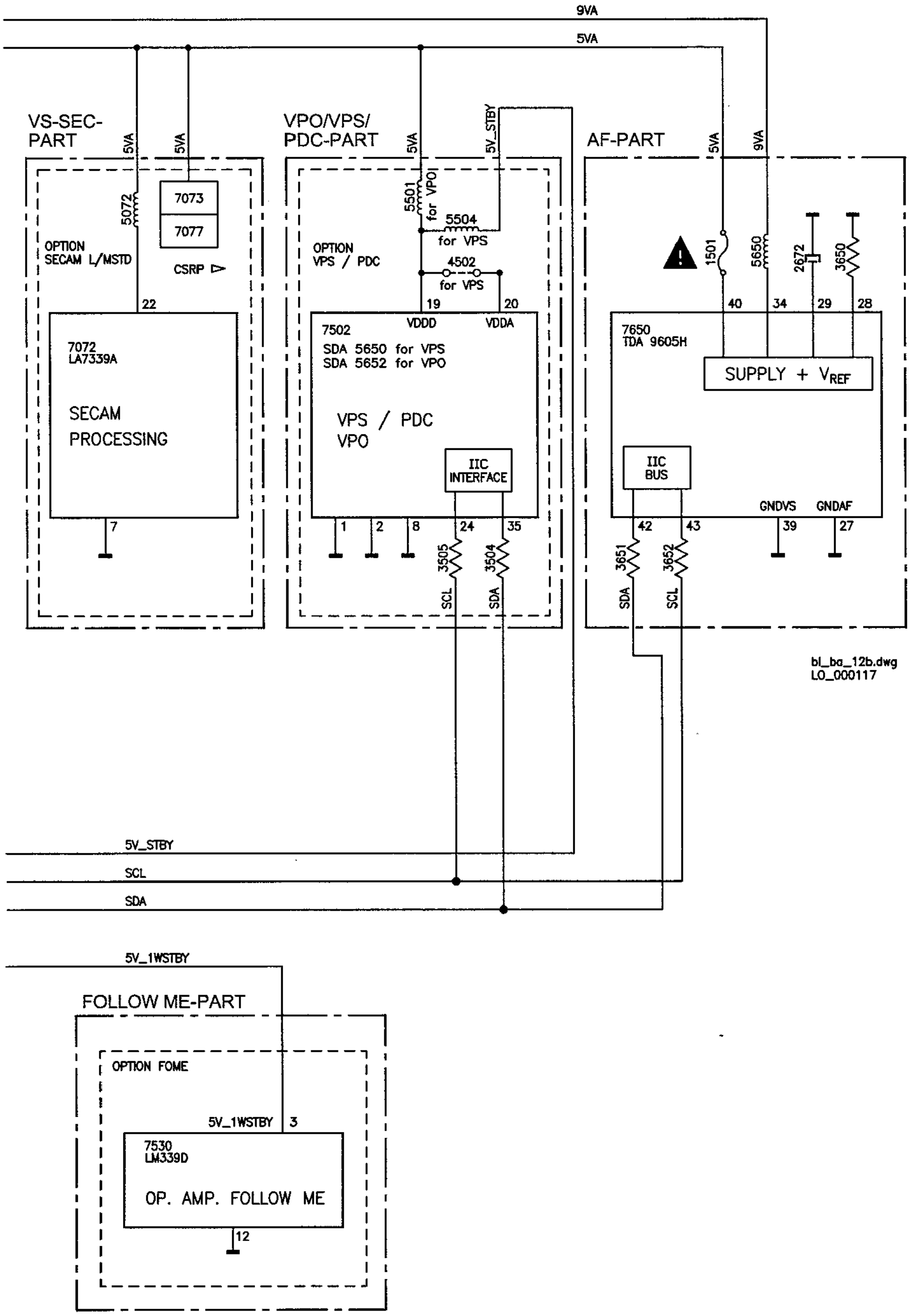
6.4 Supply voltages and Bus diagram


I/O - PART
1951
E1
14VM1
7910
7912
7914
xx
8
SCART 1
1952
E2
SCART 2
1941
SAT MOUSE
1956
CINCH
REAR
1955
5
9VASW
FRONT-CINCH
SUB
5VSTBY
5VSTBY
5VSTBY
For 2 SCART only
5115
3
18
19
20
7904
STV64001
VIDEO
MATRIX
SWITCH
IIC
BUS
9
11
14
16
7911
HEF4053BT
AUDIO
SELCT
6
7
8
-7V
3901
6901
3948
3949
18V NEG
14VM1
5V_STBY
SCL
SDA
9VASW
9VASW
9VA
5VA
5VD
FV-PART
5V_
6
1701
TUNER/
MODULATOR
TUNER
IIC
BUS
MODULATOR
IIC
BUS
15
16
11
2
A
12
3724
33V
5VSTBY
5707
14VM1
14AL
5V_STBY
SCL
SDA
5VD
5V_1WSTBY
PS - PART
7300
3
1
4
2
del for
< 1W
5301
18
5
2310
3
6
17
7303
MC44608
3
FEEDBACK
Vcc
6
PRIMARY-SWITCHING
5
OUTPUT
GROUND
4
7302
3
1
16
Option
xx
15
14
13
12
11
10
1
2317
6311
6313
6310
6312
2318
MAINS
2323
2316
5305
1301
1302
7308
1309
4303
for stereo
9VASW
9VA
33V
CSW
14VM1
for Turbo
7304
7316
14AL
9/14VM2
1304
18V_NEG
1308
7350
HEHI
HELO
1306
7306
5VD
5VA
5V_STBY
not for < 1W
6320
1307
5V_1WSTBY
I1WSTBY
STBY
CSW
I1WSTBY
STBY
18V NEG
HELO
HEHI
9/14VM2
7810
TL7705
POR
RESE
GENE
7808
7809
INTEG
DE-DC-
(AIO1, /


9VASW
9VA
5VA
5VD
DECODER PART
VS/AL- PART
5VA
7701
16
DEEMPHASIS+ SOUNDFILTER SWITCH
6 7 8 11 12 13
OPTION
7706
FILTER SWITCH
OPTION
7704
VIDEO BUFFER
5706
7705
AUDIO / VIDEO DEMODULATION
TDA9817 TDA9818
3723
3722
OPTION–TDA
28
7760
TDA9873HZ
STEREO DECODER
5763
5761
OPTION– MSP3415D
7761
ST–NIC–DECODER
1
19 5VD
4
33
5760
6760
9VASW
5003
5002
5001
16 87 58 75
40–VCC VCC C–VCC AVCC
7004–A–B
LA71595M
VIDEO+LINEAR AUDIO PROCESSING
SERIAL DECODER
Y_GND GNDVS GND AGND
22 81 86 95
23 24
3011
3012
SCL
SDA
3608,3609
7V5
6601
5000
14AL
5VA
55
7004–C
LA71595M
DELAY LINE
53
7601,7603,7608
ERASE OSCILLATOR SWITC
14AL
14VM1
14VM1
14AL
5V_STBY
SCL
SDA
5VD
5V_1WSTBY
DECK
for <1W
3821
8
7818
M24C08
EEPROM
5
6
1 2 3 4
3825
3800
3805
3812
7803
7804
6460
7461
TAE
7462
TAS
5VD
tLED
3848
3846
52 53
7899–B
TMP93CT76F
DECK– CONTROL µP
31
91
46
7899–A
6167
5170
5V_1WSTBY
3172
6170
IR–RECEIVER
1 2 3
7465
OPTION
WTL
7464
WTR
7466
FTA
3867
3868
RECP 1801
INIT 1802
95
100
99
30
DISPLAY CONTROLLER
64 72
7170
88:88
DISPLAY
1 2 44 45
3170
6172
HELO
HEHI
5460
12 20
7463
M63100BFP
HEAD DRUM DRIVER
19
16
18
8
42
5V_STBY
RESET GENERATOR POR
3464
21
22
24
1,14,36
1948
TO SCANNER MOTOR
1 MOT1
2 MOT3
3 MOT2
5 POS
6
1947
TO THREADING MOTOR
1 TMO1
3 TMO2
1945
TO SHUTTLE
OPTION
1941
Sat mouse
7812
CURRENT LIMITER
1 2 3
5VD
9/14VM2
1946
TO CAPSTAN MOTOR
1 3 5 7 8
STBY
14
13
B
C
ATOR
5VD
SYNCH ATION
PART
02, DE)

bl_ba_12a.dwg
LO_000117

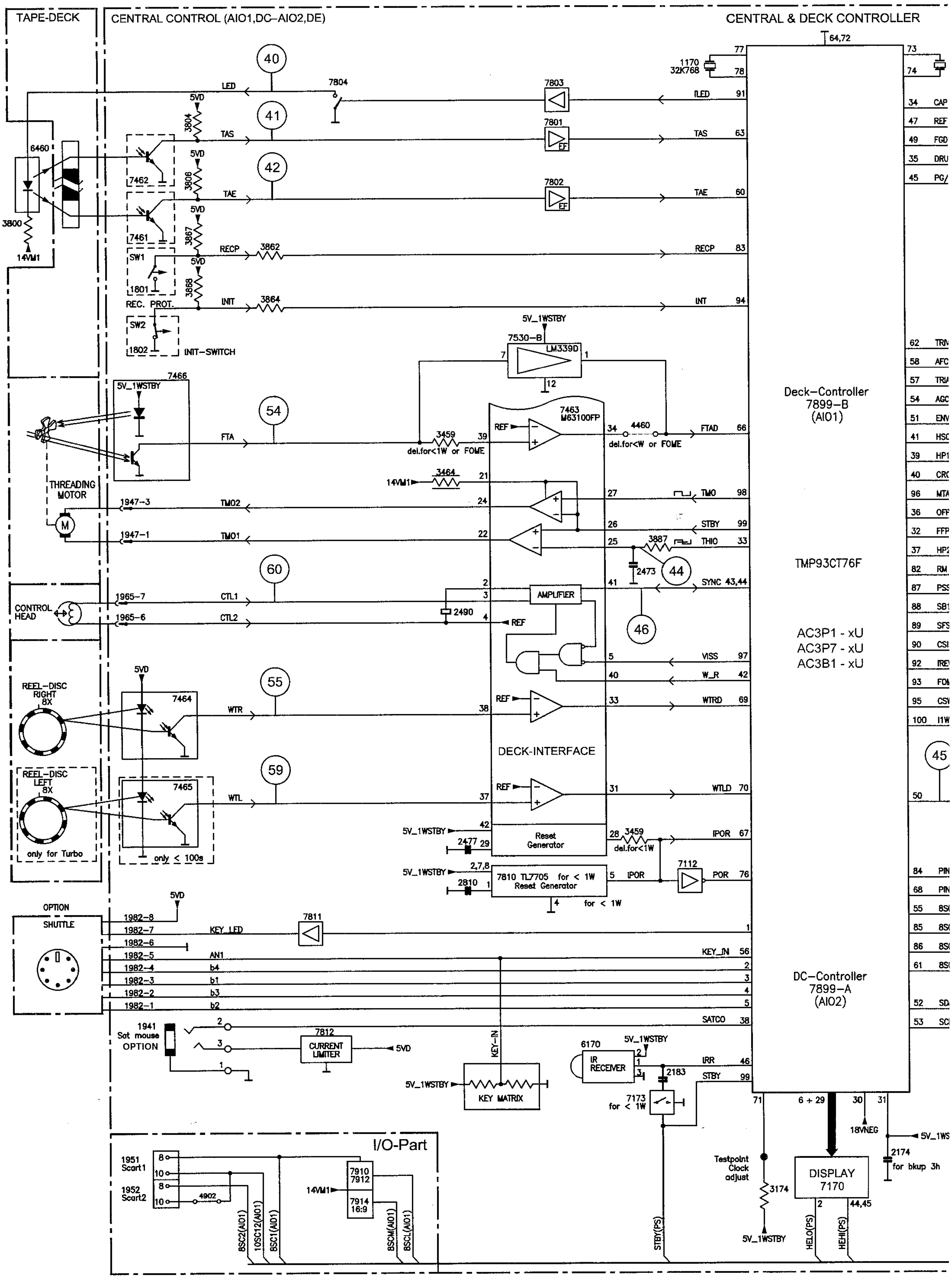
6.5 Supply voltages and Bus diagram

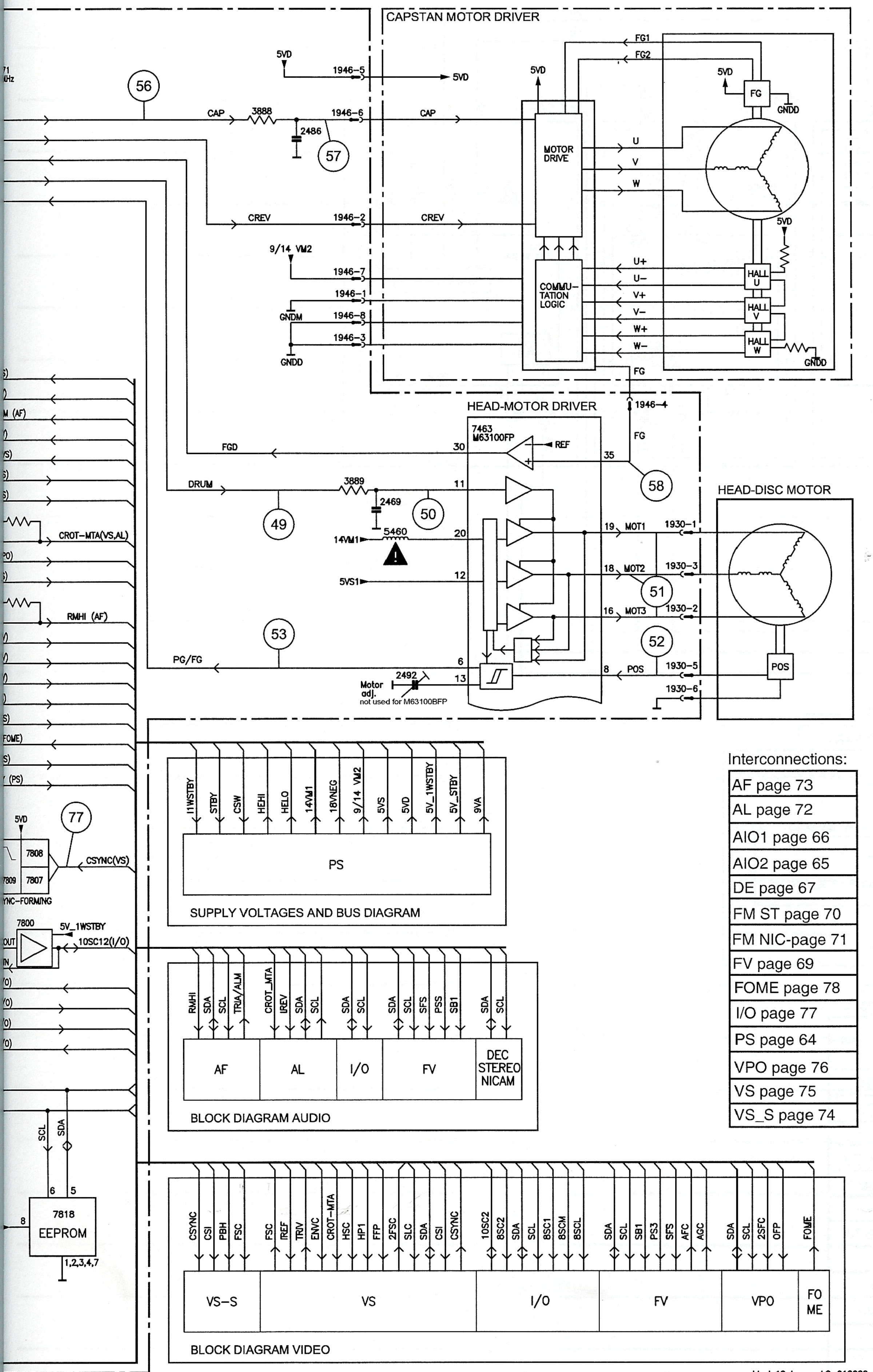

9VA
5VA
VS-SEC-PART
5VA
5VA
5072
7073
7077
OPTION SECAM L/MSTD
CSRP ▷
22
7072 LA7339A
SECAM PROCESSING
7
VPO/VPS/PDC-PART
5VA
5V_STBY
5501 for VPO
5504 for VPS
4502 for VPS
OPTION VPS / PDC
19
20
7502
VDDD
VDDA
SDA 5650 for VPS
SDA 5652 for VPO
VPS / PDC VPO
IIC INTERFACE
1
2
8
24
35
3505
3504
SCL
SDA
AF-PART
5VA
9VA
1501
5650
2672
3650
40
34
29
28
7650 TDA 9605H
SUPPLY + VREF
IIC BUS
GNDVS
GNDAF
42
43
39
27
3651
3652
SDA
SCL
bl_ba_12b.dwg
LO_000117
5V_STBY
SCL
SDA
5V_1WSTBY
FOLLOW ME-PART
OPTION FOME
5V_1WSTBY
3
7530 LM339D
OP. AMP. FOLLOW ME
12

Interconnections:

AF page 73
AL page 72
AIO1 page 66
AIO2 page 65
DE page 67
FM ST page 70
FM NIC-page 71
FV page 69
FOME page 78
I/O page 77
PS page 64
VPO page 76
VS page 75
VS_S page 74

6.6 Block diagram Central Control (AIO1, AIO2)


TAPE-DECK
CENTRAL CONTROL (AIO1,DC-AIO2,DE)
CENTRAL & DECK CONTROLLER
64,72
1170
32K768
77
78
73
74
40
LED
7804
7803
ILED 91
41
TAS
7801
TAS 63
42
TAE
7802
TAE 60
5VD
3804
3806
3867
3868
6460
3800
14VM1
7462
7461
SW1
1801
REC. PROT.
RECP
3862
RECP 83
INIT
3864
INIT 94
SW2
1802
INIT-SWITCH
5V_1WSTBY
7530-B
LM339D
7
1
12
7466
54
FTA
3459
del.for<1W or FOME
39
7463
M63100FP
REF
34
4460
del.for<W or FOME
FTAD 66
THREADING MOTOR
M
14VM1
3464
21
1947-3
TMO2
24
27
TMO 98
1947-1
TMO1
22
26
STBY 99
25
3887
THIO 33
2473
44
60
CONTROL HEAD
1965-7
CTL1
2
3
AMPLIFIER
41
SYNC 43,44
1965-6
CTL2
2490
4
REF
46
5
VISS 97
40
W_R 42
REEL-DISC RIGHT 8X
55
7464
WTR
38
REF
33
WTRD 69
DECK-INTERFACE
REEL-DISC LEFT 8X
only for Turbo
59
7465
WTL
37
REF
31
WTLD 70
only ≤ 100s
5V_1WSTBY
42
2477
29
Reset Generator
28
3459
del.for<1W
IPOR 67
5V_1WSTBY
2,7,8
2810
1
7810 TL7705 for < 1W Reset Generator
5
IPOR
4
for < 1W
7112
POR 76
OPTION
SHUTTLE
5VD
1982-8
1982-7
KEY_LED
7811
1
1982-6
1982-5
AN1
KEY_IN 56
1982-4
b4
2
1982-3
b1
3
1982-2
b3
4
1982-1
b2
5
1941
Sat mouse
OPTION
2
SATCO 38
3
7812
CURRENT LIMITER
5VD
1
KEY-IN
5V_1WSTBY
KEY MATRIX
6170
IR RECEIVER
5V_1WSTBY
2
1
3
IRR 46
2183
STBY 99
7173
for < 1W
Deck-Controller
7899-B
(AIO1)
TMP93CT76F
AC3P1 - xU
AC3P7 - xU
AC3B1 - xU
DC-Controller
7899-A
(AIO2)
71
6 ÷ 29
30
31
18VNEG
5V_1WS
2174
for bkup 3h
Testpoint Clock adjust
3174
5V_1WSTBY
DISPLAY
7170
2
44,45
HELO(PS)
HEHI(PS)
STBY(PS)
34 CAP
47 REF
49 FGD
35 DRU
45 PG/
62 TRN
58 AFC
57 TRA
54 AGC
51 ENV
41 HSC
39 HP1
40 CRC
96 MTA
36 OFF
32 FFP
37 HP2
82 RM
87 PSS
88 SB1
89 SFS
90 CSI
92 IREV
93 FOM
95 CSW
100 I1W
45
50
84 PIN
68 PIN
55 8SC
85 8SC
86 8SC
61 8SC
52 SDA
53 SCL
I/O-Part
1951
Scart1
8
10
1952
Scart2
8
10
4902
8SC2(AIO1)
10SC12(AIO1)
8SC1(AIO1)
14VM1
7910
7912
7914
16:9
8SCM(AIO1)
8SCL(AIO1)


CAPSTAN MOTOR DRIVER
56
57
5VD
1946-5
5VD
CAP
3888
2486
1946-6
CAP
CREV
1946-2
CREV
9/14 VM2
1946-7
1946-1
GNDM
1946-8
1946-3
GNDD
MOTOR DRIVE
COMMU-TATION LOGIC
FG1
FG2
5VD
5VD
FG
GNDD
U
V
W
5VD
U+
U-
V+
V-
W+
W-
HALL U
HALL V
HALL W
GNDD
FG
1946-4
HEAD-MOTOR DRIVER
7463 M63100FP
REF
FGD
30
35
FG
58
DRUM
3889
2469
11
49
50
14VM1
5460
20
5VS1
12
19
MOT1
1930-1
18
MOT2
1930-3
51
16
MOT3
1930-2
52
53
PG/FG
6
8
POS
1930-5
2492
13
Motor adj.
not used for M63100BFP
1930-6
HEAD-DISC MOTOR
POS
CROT-MTA(VS,AL)
RMHI (AF)
5VD
77
7808
7807
7809
CSYNC(VS)
YNC-FORMING
7800
5V_1WSTBY
10SC12(I/O)
OUT
IN
SCL
SDA
6
5
8
7818
EEPROM
1,2,3,4,7
11WSTBY
STBY
CSW
HEHI
HELO
14VM1
18VNEG
9/14 VM2
5VS
5VD
5V_1WSTBY
5V_STBY
9VA
PS
SUPPLY VOLTAGES AND BUS DIAGRAM
RMHI
SDA
SCL
TRIA/ALM
CROT_MTA
IREV
SDA
SCL
SDA
SCL
SDA
SCL
SFS
PSS
SB1
SDA
SCL
AF
AL
I/O
FV
DEC STEREO NICAM
BLOCK DIAGRAM AUDIO
CSYNC
CSI
PBH
FSC
FSC
IREF
TRIV
ENVC
CROT-MTA
HSC
HP1
FFP
2FSC
SLC
SDA
CSI
CSYNC
10SC2
8SC2
SDA
SCL
8SC1
8SCM
8SCL
SDA
SCL
SB1
PS3
SFS
AFC
AGC
SDA
SCL
2SFC
OFP
FOME
VS-S
VS
I/O
FV
VPO
FO ME
BLOCK DIAGRAM VIDEO

Interconnections:

AF page 73
AL page 72
AIO1 page 66
AIO2 page 65
DE page 67
FM ST page 70
FM NIC-page 71
FV page 69
FOME page 78
I/O page 77
PS page 64
VPO page 76
VS page 75
VS_S page 74

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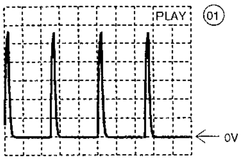
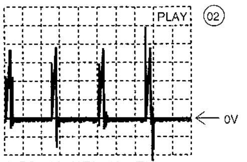
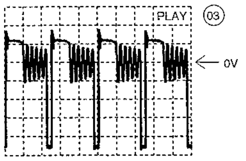
6.7 Waveforms



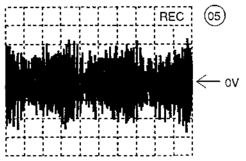
(01)
A: DC, 2 V/Div, 10us/Div
T 7302 GATE



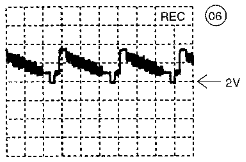
(02)
A: DC, 100mV/Div, 10us/Div
IC 7303 PIN2



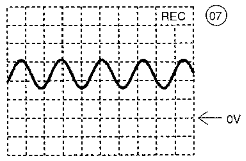
(03)
A: DC, 10 V/Div, 10us/Div
TRAFO5301 PIN5



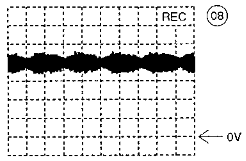
(05)
A: DC, 500mV/Div, 20us/Div
IC 1701 PIN17



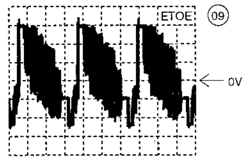
(06)
A: DC, 500mV/Div, 20us/Div
T7704 EMITTER VFV



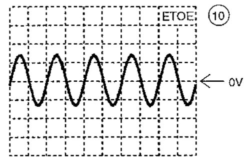
(07)
A: DC, 1 V/Div, 500us/Div
IC 7705 PIN8 AFV MONO



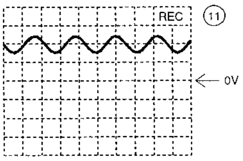
(08)
A: DC, 500mV/Div, 2us/Div
IC 7705 PIN12 SIF2



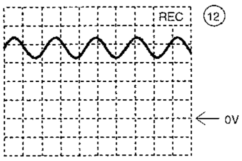
(09)
A: AC, 200mV/Div, 20us/Div
TUNER 1701 PIN1 VMOD



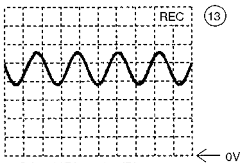
(10)
A: AC, 500mV/Div, 500us/Div
TUNER 1701 PIN3 AMCO



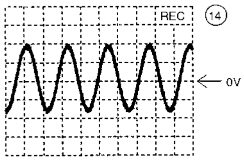
(11)
A: DC, 2 V/Div, 500us/Div
IC 7761 PIN30,31 AFL,AFR



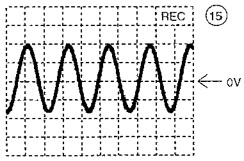
(12)
A: DC, 1 V/Div, 500us/Div
IC 7650 PIN6 - 9



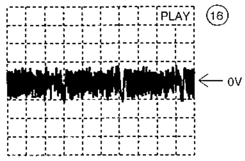
(13)
A: DC, 1 V/Div, 500us/Div
IC 7650 PIN16,17 AOUT1



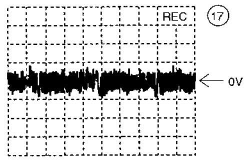
(14)
A: AC, 1 V/Div, 500us/Div
IC 7650 PIN19,20 AOUT2



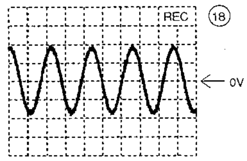
(15)
A: AC, 500mV/Div, 500us/Div
IC 7650 PIN15 AMCO



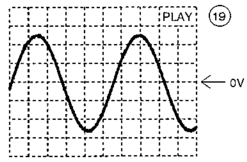
(16)
A: AC, 50mV/Div, 20us/Div
IC 7650 PIN35,37 AH1/2



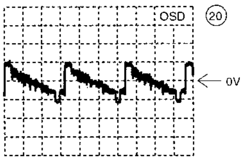
(17)
A: AC, 50mV/Div, 20us/Div
IC 7650 PIN36 AHC



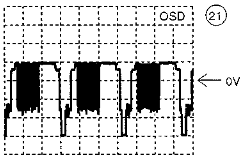
(18)
A: AC, 200mV/Div, 500us/Div
IC 7650 PIN21 AMLR



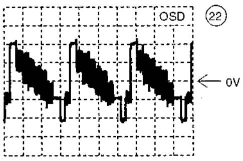
(19)
A: AC, 200mV/Div, 200us/Div
IC 7650 PIN22 AMLP



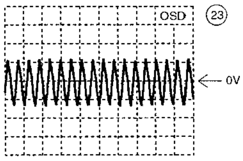
(20)
A: AC, 500mV/Div, 20us/Div
IC 7502 PIN17



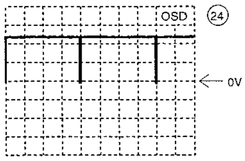
(21)
A: AC, 500mV/Div, 20us/Div
IC 7502 PIN15 VOUT



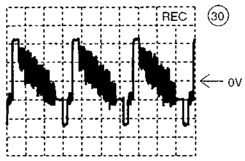
(22)
A: AC, 500mV/Div, 20us/Div
IC 7502 PIN18 VSB



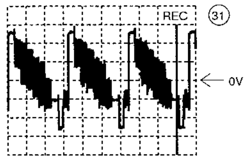
(23)
A: AC, 100mV/Div, 200ns/Div
IC 7502 PIN3 2FSC



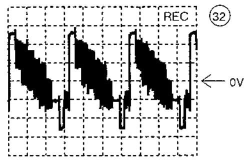
(24)
A: DC, 2 V/Div, 5ms/Div
IC 7502 PIN9 OFP



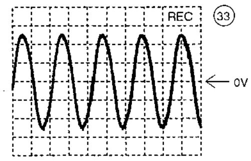
(30)
A: AC, 200mV/Div, 20us/Div
IC 7904 PIN2 VIN1



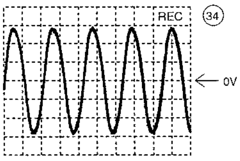
(31)
A: DC, 200mV/Div, 20us/Div
SCART1 PIN19



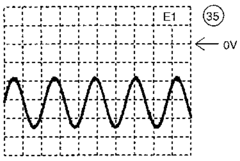
(32)
A: DC, 200mV/Div, 20us/Div
SCART2 PIN19



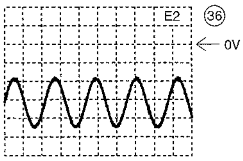
(33)
A: DC, 200mV/Div, 500us/Div
SCART 1 PIN1/3



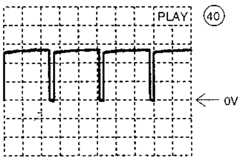
(34)
A: DC, 200mV/Div, 500us/Div
SCART 2 PIN1/3



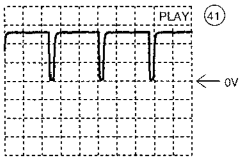
(35)
A: DC, 200mV/Div, 500us/Div
T7906 EMITTER AIN1



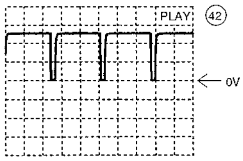
(36)
A: DC, 200mV/Div, 500us/Div
T7905 EMITTER AIN2



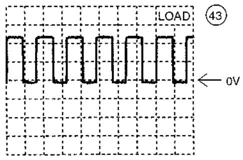
(40)
A: DC, 5 V/Div, 5ms/Div
T 7804 COLLECTOR LED



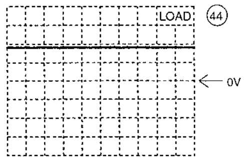
(41)
A: DC, 2 V/Div, 5ms/Div
T 7462 COLLECTOR TAS



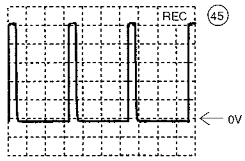
(42)
A: DC, 2 V/Div, 5ms/Div
T 7461 COLLECTOR TAE



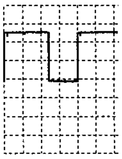
(43)
A: DC, 2 V/Div, 20us/Div
IC 7899-B PIN33 THIO

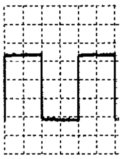


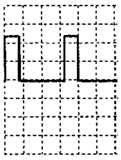
(44)
A: DC, 2 V/Div, 20us/Div
IC 7463 PIN25 THIO

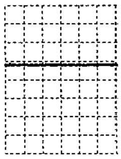


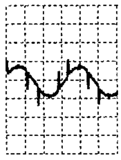
(45)
A: DC, 1 V/Div, 20us/Div
T 7809 COLLECTOR CSYNC

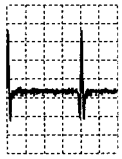

A: DC, 2 V/Div, 10ms/
TP 9802 SYNC

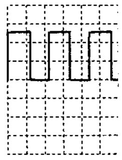

A: DC, 500mV/Div, 1C
TP9803 HP1

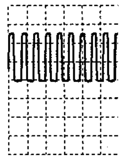

A: DC, 2 V/Div, 10us/
IC 7899-B PIN35 DR

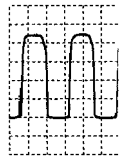

A: DC, 1 V/Div, 200us
IC 7463 PIN11 DRUM

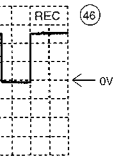

A: AC, 5 V/Div, 2ms/
CON 1948 PIN 1-3


A: DC, 200mV/Div, 1
CON 1948 PIN 5 PG


A: DC, 2 V/Div, 1ms/
IC 7463 PIN6 PG/FG

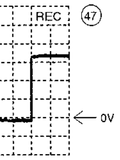

A: DC, 2 V/Div, 20ms
T 7466 COLLECTO


A: DC, 1 V/Div, 200
T 7464 COLLECTO



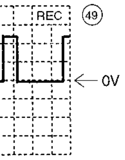
(46)

Div



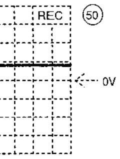
(47)

ms/Div



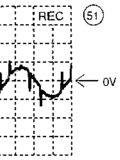
(49)

Div
UM_DIG



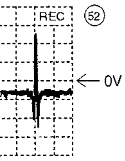
(50)

/Div
I



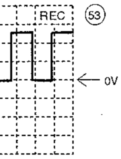
(51)

Div



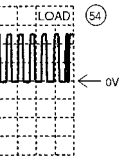
(52)

0ms/Div



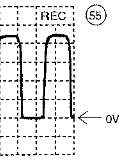
(53)

Div



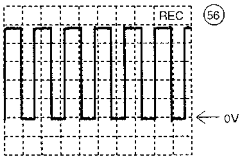
(54)

/Div
FTA



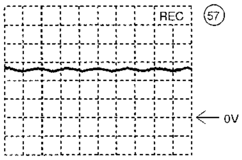
(55)

s/Div
R WTR



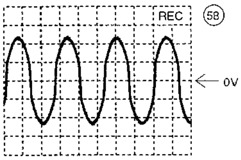
(56)

A: DC, 1 V/Div, 20us/Div
IC7899-B PIN34 CAP_DIG



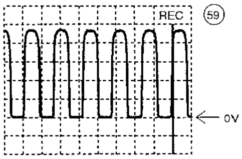
(57)

A: DC, 1 V/Div, 20us/Div
CON 1946 PIN6 CAP



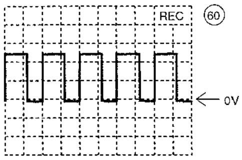
(58)

A: AC, 500mV/Div, 500us/Div
CON 1946 PIN 4 FG



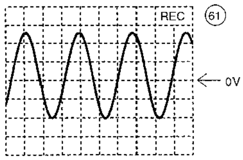
(59)

A: DC, 1 V/Div, 500ms/Div
T 7465 COLLECTOR WTL



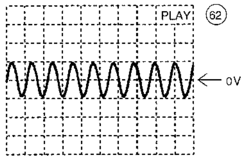
(60)

A: DC, 2 V/Div, 20ms/Div
IC 7463 PIN3 CTL1



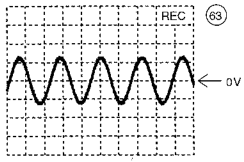
(61)

A: DC, 10 V/Div, 5us/Div
R 3625 BIAS



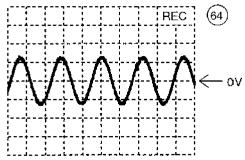
(62)

A: AC, 500mV/Div, 1ms/Div
IC 7004-A PIN96 AMLP



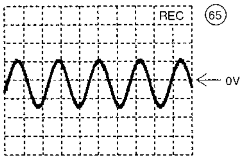
(63)

A: AC, 100mV/Div, 500us/Div
IC 7004-A PIN80 AFV



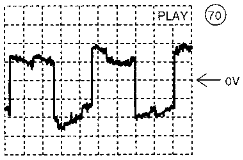
(64)

A: 6C, 100mV/Div, 500us/Div
IC 7004-A PIN78 AIN2



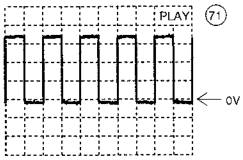
(65)

A: AC; 100mV/Div, 500us/Div
IC 7704-A PIN76 AIN1



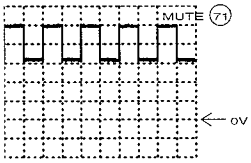
(70)

A: AC, 50mV/Div, 500us/Div
IC 7004-B PIN94 ENVC



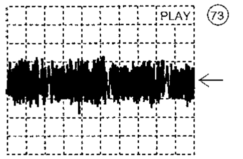
(71)

A: DC, 500mV/Div, 20ms/Div
IC 7004-B PIN10 CROT/MTA



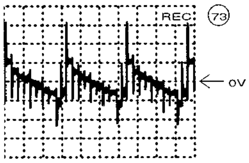
(71)

A: DC, 1 V/Div, 20ms/Div
IC 7004-B PIN10 CROT/MTA



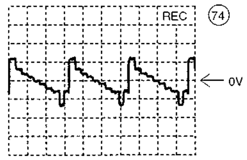
(73)

A: AC, 100mV/Div, 20us/Div
T 7003 EMITTER



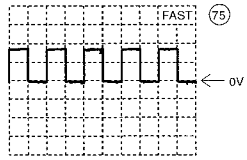
(73)

A: AC, 200mV/Div, 20us/Div
T 7003 EMITTER



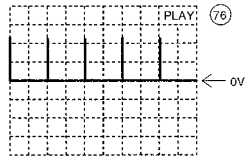
(74)

A: AC, 200mV/Div, 20us/Div
T 7008 EMITTER



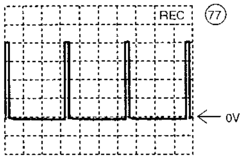
(75)

A: DC, 1 V/Div, 20ms/Div
IC 7004-B PIN25 HSC



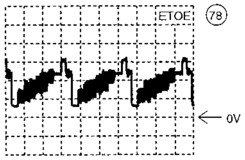
(76)

A: DC, 2 V/Div, 10ms/Div
IC 7004-B PIN26 FFP



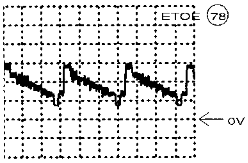
(77)

A: DC, 1 V/Div, 20us/Div
IC 7072 PIN27 CSYNC



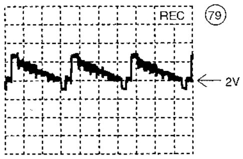
(78)

A: DC, 1 V/Div, 20us/Div
IC 7004-B PIN29 VSB PAL



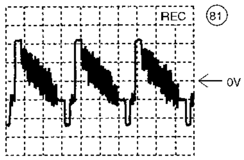
(78)

A: DC, 1 V/Div, 20us/Div
IC 7004-B PIN29 VSB SECAM



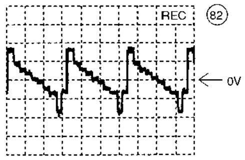
(79)

A: DC, 500mV/Div, 20us/Div
C 2075,2036 VREC



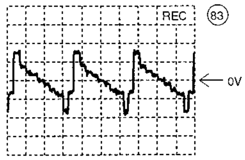
(81)

A: AC, 200mV/Div, 20us/Div
IC 7704-B PIN38 VBS



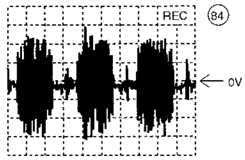
(82)

A: AC, 100mV/Div, 20us/Div
IC 7004-C PIN45



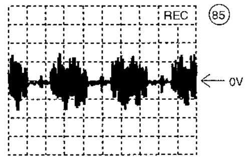
(83)

A: AC, 100mV/Div, 20us/Div
IC 7004-C PIN46



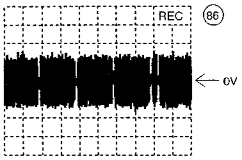
(84)

A: AC, 50mV/Div, 20us/Div
IC 7004-C PIN52



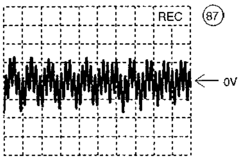
(85)

A: AC, 100mV/Div, 20us/Div
IC 7004-C PIN51



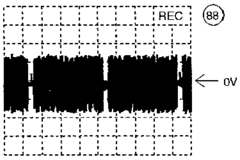
(86)

A: AC, 100mV/Div, 10ms/Div
IC 7004-C PIN54



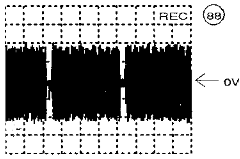
(87)

A: AC, 200mV/Div, 1us/Div
T 7002 EMITTER FMPV



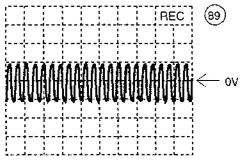
(88)

A: AC, 100mV/Div, 5ms/Div
T 7073 EMITTER (PAL)CSRP



(88)

A: AC, 100mV/Div, 5ms/Div
T 7703 EMITTER (SECAM L)



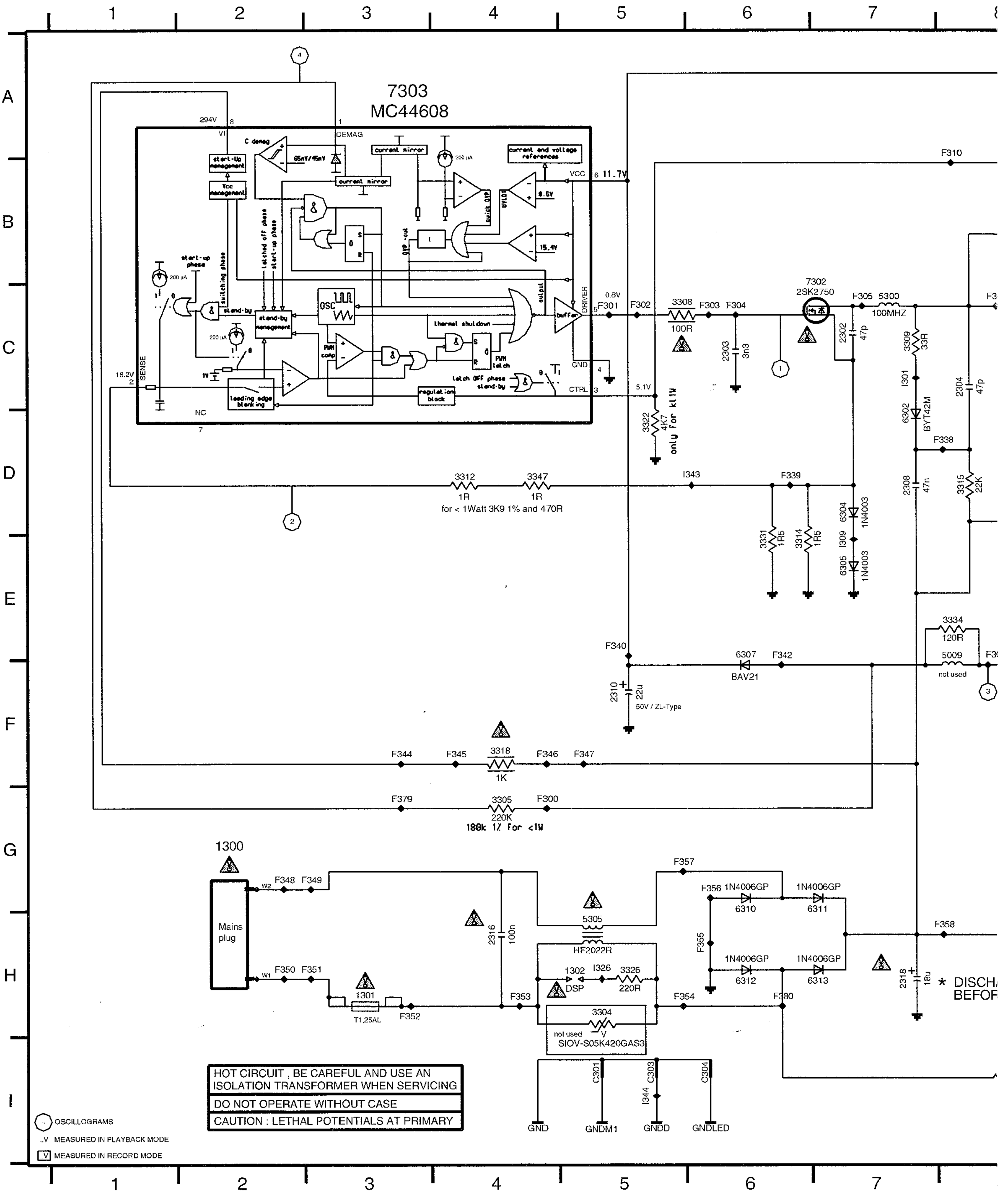
(89)

A: AC, 200mV/Div, 500ns/Div
T7005 EMITTER FSC

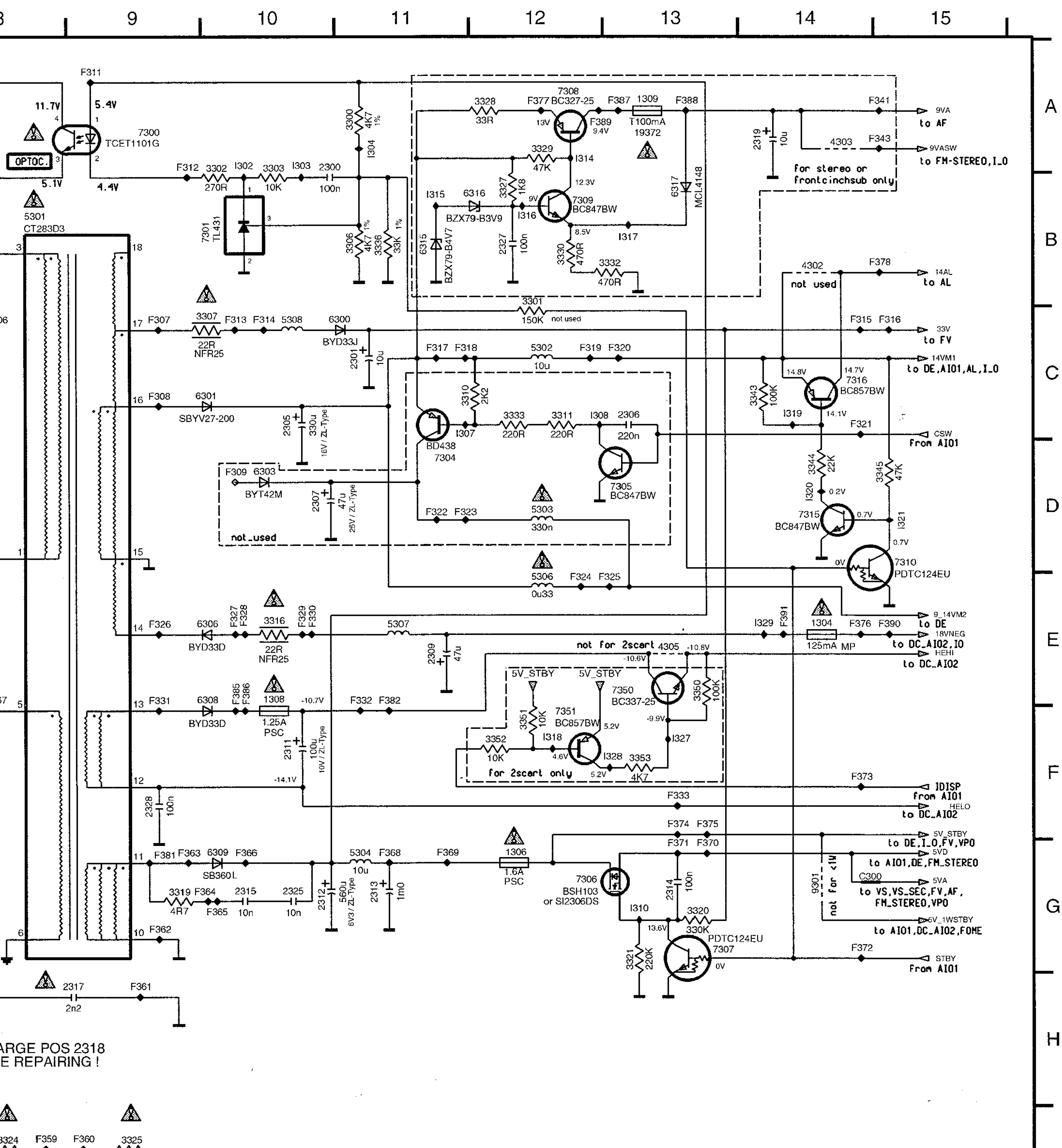
7. Circuit diagrams and PWB layouts, Wiring diagram

7.1 Power supply (PS)

0040 B5	1309 A13	2306 C13	2313 G11	2325 G10	3304 H5	3311 C12	3320 G13	3328 A12	3336 B11	3352 F12	5301 B8	5308 C10	6306 E10	6313 H7	7303 A3	7310 D15	9002 H1
1300 G2	2300 A10	2307 D10	2314 G13	2327 B12	3305 G4	3312 D4	3321 G13	3329 A12	3343 C14	3353 F13	5302 C12	6300 C11	6307 E6	6315 B11	7304 D11	7315 D14	9003 H1
1301 H3	2301 C11	2308 D7	2315 G10	2328 F9	3306 B11	3314 E6	3322 D5	3330 B12	3344 D14	4302 B14	5303 D12	6301 C10	6308 E10	6316 B12	7305 D13	7316 C14	9004 H1
1302 H5	2302 C7	2309 E11	2316 H4	3300 A11	3307 C10	3315 D8	3324 I8	3331 E6	3345 D15	4303 A14	5304 G11	6302 D7	6309 G10	6317 B13	7306 G12	7350 E13	9005 I1
1304 E14	2303 C6	2310 F5	2317 H9	3301 B12	3308 C5	3316 E10	3325 I9	3332 B13	3347 D4	4305 E13	5305 H5	6303 D10	6310 G6	7300 A9	7307 G13	7351 F12	9006 I1
1306 G12	2304 C8	2311 F10	2318 H7	3302 A10	3309 C7	3318 F4	3326 H5	3333 C12	3350 E13	5009 E8	5306 E12	6304 D7	6311 G7	7301 B10	7308 A12	9000 H1	9007 I1
1308 E10	2305 C10	2312 G10	2319 A14	3303 A10	3310 C11	3319 G9	3327 B12	3334 E8	3351 F12	5300 C7	5307 E11	6305 E7	6312 H6	7302 C7	7309 B12	9001 H1	9301 G14


1
2
3
4
5
6
7
A
B
C
D
E
F
G
H
I
7303
MC44608
294V
VI
DEMAG
C demag
start-Up management
Vcc management
current mirror
current and voltage references
VCC
11.7V
8.5V
15.4V
UVLO1
quick OVP
OVP-out
latched off phase
start-up phase
switching phase
start-up phase
stand-by
stand-by management
OSC
PWM comp
thermal shutdown
PWM latch
latch OFF phase stand-by
regulation block
leading edge blanking
buffer
DRIVER
output
GND
CTRL
18.2V
ISENSE
NC
0.8V
F301
F302
3308
100R
F303
F304
2303
3n3
7302
2SK2750
F305
5300
100MHZ
2302
47p
3309
33R
1301
6302
BYT42M
2304
47p
F310
F338
5.1V
3322
4K7
only for k11W
3312
1R
3347
1R
for < 1Watt 3K9 1% and 470R
I343
F339
3331
1R5
3314
1R5
6304
1N4003
I309
6305
1N4003
2308
47n
3315
22K
3334
120R
5009
not used
F340
6307
BAV21
F342
2310
22u
50V / ZL-Type
F344
F345
3318
1K
F346
F347
F379
3305
220K
F300
180k 1% for <1W
1300
Mains plug
W2
W1
F348
F349
F350
F351
1301
T1,25AL
F352
2316
100n
F353
F357
5305
HF2022R
1302
DSP
I326
3326
220R
3304
not used
SIOV-S05K420GAS3
F354
F355
F356
1N4006GP
6310
1N4006GP
6311
1N4006GP
6312
1N4006GP
6313
F380
F358
2318
18u
* DISCH
BEFOR
C301
C303
I344
C304
GND
GNDM1
GNDD
GNDLED
HOT CIRCUIT , BE CAREFUL AND USE AN ISOLATION TRANSFORMER WHEN SERVICING
DO NOT OPERATE WITHOUT CASE
CAUTION : LETHAL POTENTIALS AT PRIMARY
OSCILLOGRAMS
..V MEASURED IN PLAYBACK MODE
V MEASURED IN RECORD MODE

C300	G14
C301	I5
C303	I5
C304	I6
F300	G4
F301	C5
F302	C5
F303	C6
F304	C6
F305	C7
F306	C8
F307	C9
F308	C9
F309	D10
F310	A8
F311	A9
F312	A9
F313	C10
F314	C10
F315	C14
F316	C15
F317	C11
F318	C11
F319	C12
F320	C13
F321	C14
F322	D11
F323	D11
F324	E12
F325	E13
F326	E9
F327	E10
F328	E10
F329	E10
F330	E10
F331	E9
F332	E11
F333	F13
F338	D8
F339	D6
F340	E5
F341	A15
F342	E6
F343	A15
F344	F3
F345	F4
F346	F4
F347	F5
F348	G2
F349	G3
F350	H2
F351	H3
F352	H3
F353	H4
F354	H5
F355	H6
F356	G6
F357	G5
F358	H8
F359	I8
F360	I9
F361	H9
F362	G9
F363	G9
F364	G10
F365	G10
F366	G10
F367	E8
F368	G11
F369	G11
F370	G13
F371	G13
F372	G14
F373	F14
F374	F13
F375	F13
F376	E14
F377	A12
F378	B15
F379	G3
F380	H6
F381	G9
F382	E11
F385	E10
F386	E10
F387	A13
F388	A13
F389	A12
F390	E15
F391	E14
I301	C7
I302	A10
I303	A10
I304	A11
I307	C11
I308	C12
I309	E7
I310	G13
I314	A12
I315	B11
I316	B12
I317	B13
I318	F12
I319	C14
I320	D14
I321	D15
I326	H5
I327	F13
I328	F13
I329	E14
I343	D6
I344	I5

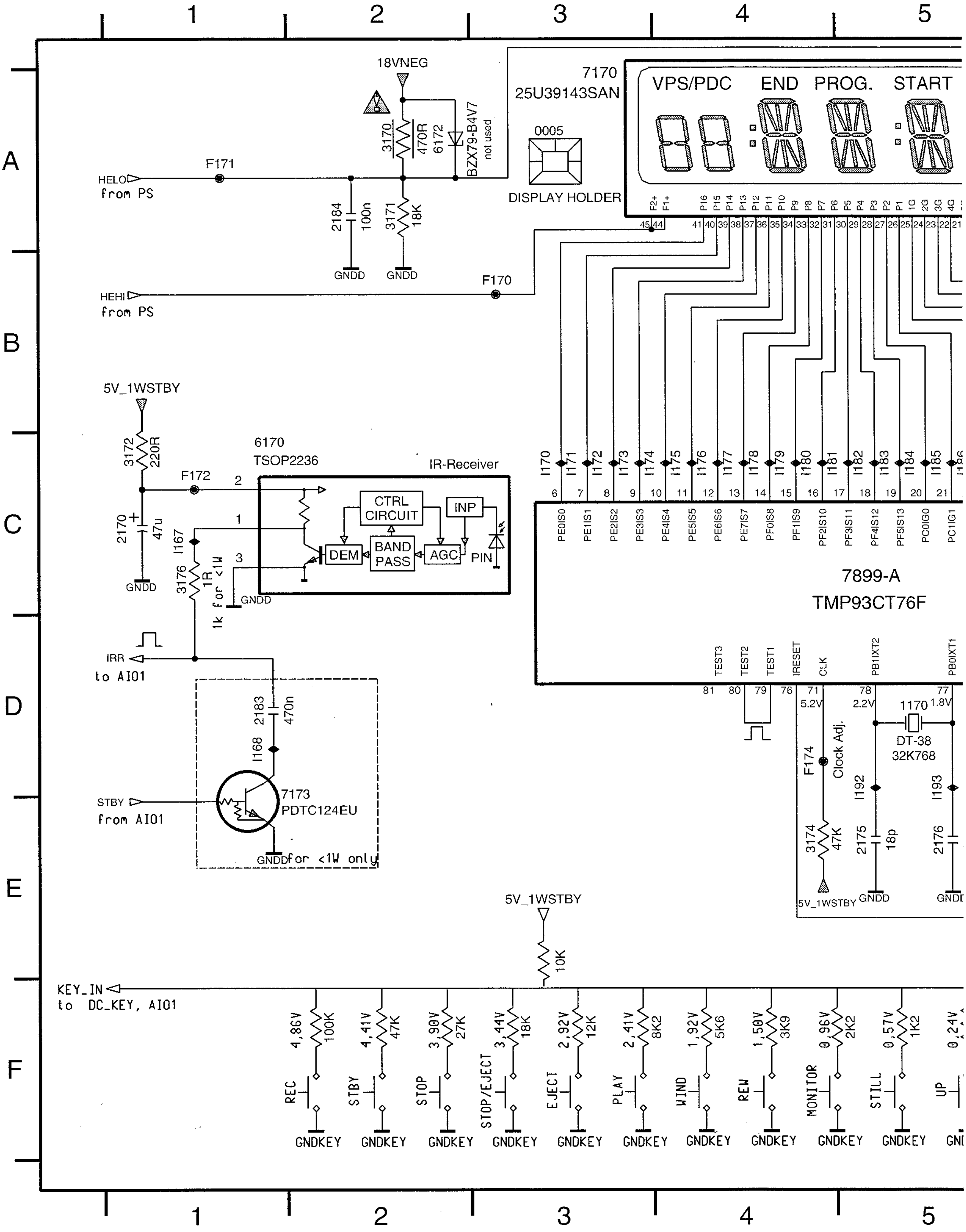

8
9
10
11
12
13
14
15
A
B
C
D
E
F
G
H
I
F311
11.7V
5.4V
4
1
7300
TCET1101G
3
2
OPTOC.
5.1V
4.4V
5301
CT283D3
3
18
F312
3302
270R
I302
3303
10K
I303
2300
100n
7301
TL431
3300
4K7
1%
I304
3306
4K7
1%
3336
33K
1%
7308
F377 BC327-25
3328
33R
13V
F389
9.4V
F387
1309
T100mA
19372
F388
3329
47K
I314
3327
1K8
12.3V
I315
6316
BZX79-B3V9
9V
I316
7309
BC847BW
6315
BZX79-B4V7
2327
100n
8.5V
3330
470R
3332
470R
I317
6317
MCL4148
2319
10u
F341
9VA
to AF
4303
F343
9VASW
to FM-STEREO,I_O
for stereo or frontcinchsub only
4302
not used
F378
14AL
to AL
3301
150K
not used
17
F307
3307
22R
NFR25
F313
F314
5308
6300
BYD33J
2301
10u
F317
F318
5302
10u
F319
F320
F315
F316
33V
to FV
14VM1
to DE,AI01,AL,I_O
3310
2K2
16
F308
6301
SBYV27-200
2305
330u
16V / ZL-Type
7304
BD438
I307
3333
220R
3311
220R
I308
2306
220n
7305
BC847BW
3343
100K
14.8V
14.7V
7316
BC857BW
I319
14.1V
F321
CSW
From AI01
F309
6303
BYT42M
2307
47u
25V / ZL-Type
not_used
F322
F323
5303
330n
3344
22K
I320
0.2V
7315
BC847BW
0.7V
3345
47K
I321
0.7V
15
1
0V
7310
PDTC124EU
5306
0u33
F324
F325
14
F326
6306
BYD33D
F327
F328
3316
22R
NFR25
F329
F330
5307
2309
47u
I329
F391
1304
125mA MP
F376
F390
9_14VM2
to DE
18VNEG
to DC_AI02,IO
HEHI
to DC_AI02
not for 2scart
4305
-10.6V
-10.6V
5V_STBY
5V_STBY
7350
BC337-25
3350
100K
3351
10K
7351
BC857BW
5.2V
-9.9V
I327
13
F331
6308
BYD33D
F385
F386
1308
1.25A
PSC
-10.7V
F332
F382
2311
100u
10V / ZL-Type
3352
10K
I318
4.6V
I328
5.2V
3353
4K7
for 2scart only
12
-14.1V
F373
IDISP
From AI01
2328
100n
F333
HELO
to DC_AI02
F374
F375
5V_STBY
to DE,I_O,FV,VPO
11
F381
F363
6309
SB360L
F366
5304
10u
F368
F369
1306
1.6A
PSC
F371
F370
5VD
to AI01,DE,FM_STEREO
C300
5VA
to VS,VS_SEC,FV,AF,FM_STEREO,VPO
9301
not for <1W
3319
4R7
F364
F365
2315
10n
2325
10n
2312
560u
6V3 / ZL-Type
2313
1m0
7306
BSH103
or SI2306DS
2314
100n
I310
3320
330K
13.6V
6V_1WSTBY
to AI01,DC_AI02,FOME
PDTC124EU
7307
3321
220K
0V
F372
STBY
From AI01
6
10
F362
2317
2n2
F361
ARGE POS 2318
E REPAIRING !
3324
3M3
F359
F360
3325
3M3

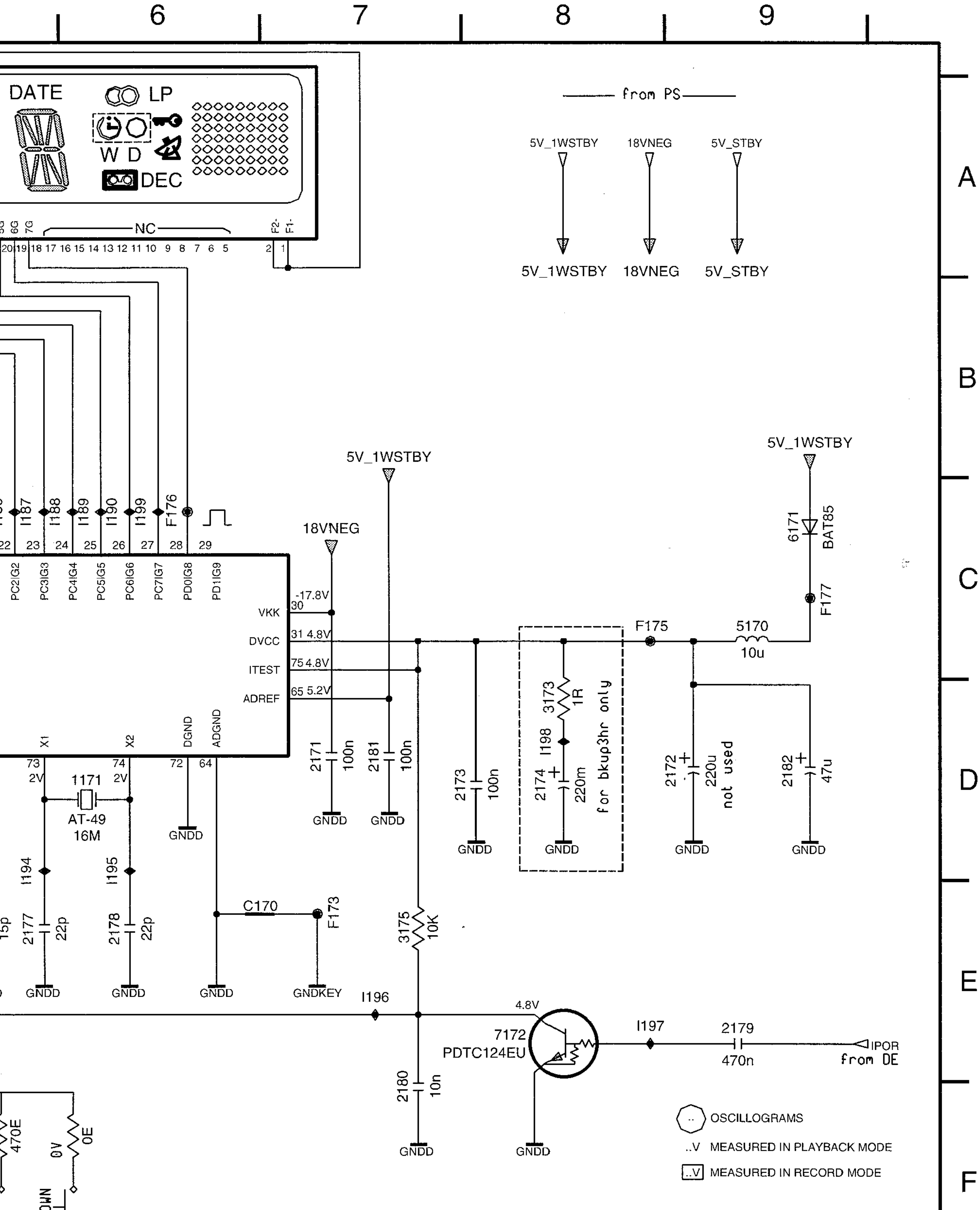
Interconnections:

AF page 73	AL page 72	AIO1 page 66	AIO2 page 65	DE page 67	FM ST page 70	FM NIC-page 71
FV page 69	FOME page 78	I/O page 77	PS page 64	VPO page 76	VS page 75	VS_S page 74

PS-8920-12

7.2 Display control (AIO2)


18VNEG
3170
470R
6172
BZX79-B4V7
not used
HELO
from PS
F171
2184
100n
3171
18K
GNDD
GNDD
7170
25U39143SAN
0005
DISPLAY HOLDER
VPS/PDC
END
PROG.
START
F2+ F1+ P16 P15 P14 P13 P12 P11 P10 P9 P8 P7 P6 P5 P4 P3 P2 P1 1G 2G 3G 4G
45 44 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21
HEHI
from PS
F170
5V_1WSTBY
3172
220R
F172
6170
TSOP2236
IR-Receiver
CTRL CIRCUIT
INP
DEM
BAND PASS
AGC
PIN
2170
47u
I167
3176
1R for <1W
1k
GNDD
IRR
to AI01
2183
470n
I168
7173
PDTC124EU
STBY
from AI01
GNDD for <1W only
I170 I171 I172 I173 I174 I175 I176 I177 I178 I179 I180 I181 I182 I183 I184 I185
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
PE0IS0 PE1IS1 PE2IS2 PE3IS3 PE4IS4 PE5IS5 PE6IS6 PF0IS7 PF0IS8 PF1IS9 PF2IS10 PF3IS11 PF4IS12 PF5IS13 PC0IG0 PC1IG1
7899-A
TMP93CT76F
TEST3 TEST2 TEST1 IRESET CLK PB1IXT2 PB0IXT1
81 80 79 76 71 78 77
5.2V
2.2V
1.8V
1170
DT-38
32K768
F174
Clock Adj.
I192
I193
3174
47K
2175
18p
2176
5V_1WSTBY
GNDD
5V_1WSTBY
10K
KEY_IN
to DC_KEY, AI01
4,86V 100K REC
4,41V 47K STBY
3,90V 27K STOP
3,44V 18K STOP/EJECT
2,92V 12K EJECT
2,41V 8K2 PLAY
1,92V 5K6 WIND
1,50V 3K9 REW
0,96V 2K2 MONITOR
0,57V 1K2 STILL
0,24V UP
GNDKEY
1 2 3 4 5
A B C D E F


6
7
8
9
A
B
C
D
E
F
DATE
LP
W D
DEC
NC
F2-
F1-
20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5
2 1
from PS
5V_1WSTBY
18VNEG
5V_STBY
I187
I188
I189
I190
I199
F176
22 23 24 25 26 27 28 29
PC2IG2
PC3IG3
PC4IG4
PC5IG5
PC6IG6
PC7IG7
PD0IG8
PD1IG9
VKK
DVCC
ITEST
ADREF
-17.8V
30
31 4.8V
75 4.8V
65 5.2V
X1
X2
DGND
ADGND
73 2V
74 2V
72
64
1171
AT-49
16M
GNDD
18VNEG
5V_1WSTBY
2171 100n
2181 100n
2173 100n
3173 1R
I198
2174 220m
for bkup3hr only
F175
5170 10u
2172 220u not used
2182 47u
5V_1WSTBY
6171 BAT85
F177
I194
I195
2177 22p
2178 22p
15p
C170
F173
GNDKEY
3175 10K
I196
4.8V
7172
PDTC124EU
I197
2179 470n
IPOR from DE
2180 10n
470E
0V
0E
DOWN
KEY
GNDKEY
OSCILLOGRAMS
..V MEASURED IN PLAYBACK MODE
..V MEASURED IN RECORD MODE

Interconnections:

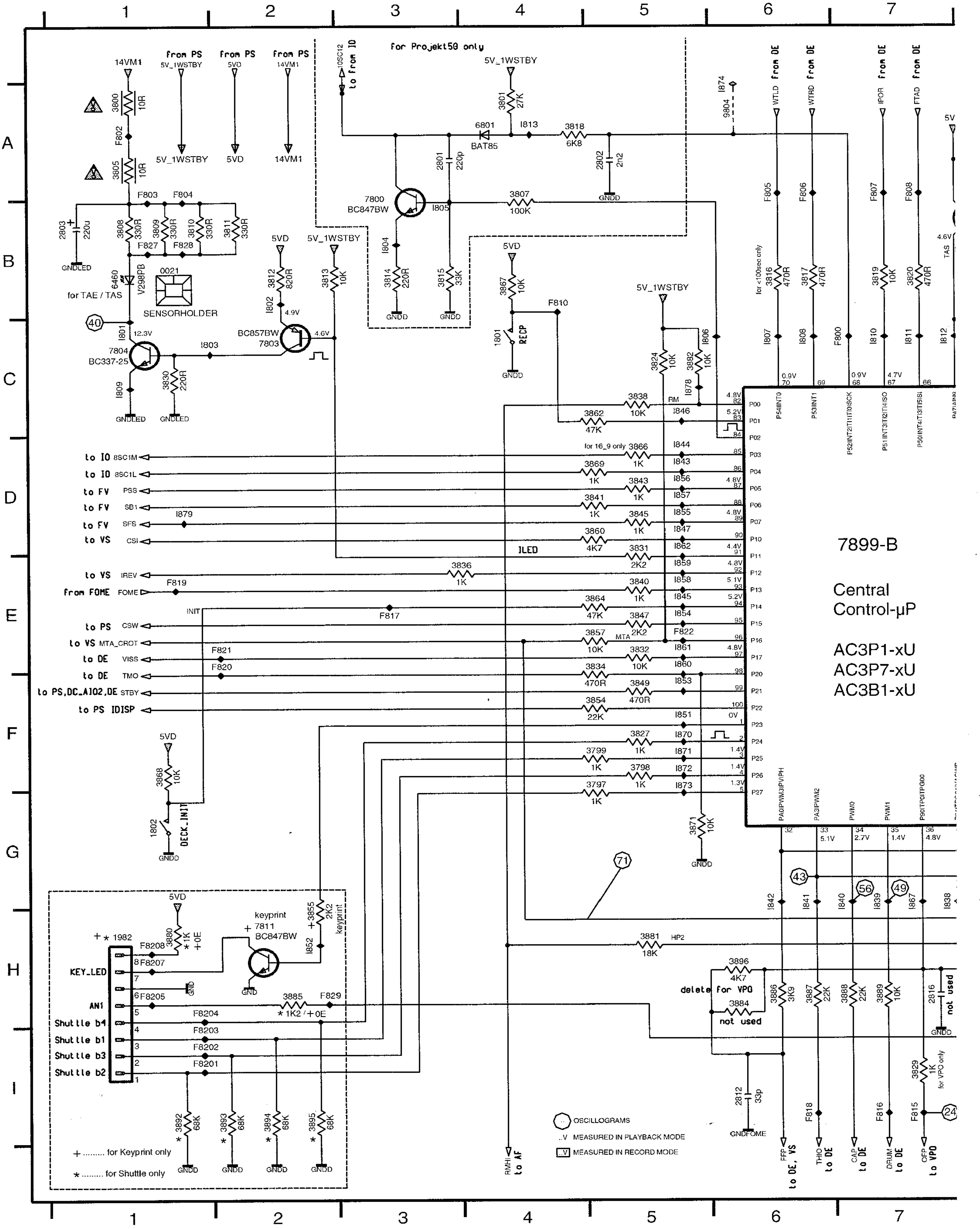
AF page 73	AL page 72	AIO1 page 66	AIO2 page 65	DE page 67	FM ST page 70	FM NIC-page 71
FV page 69	FOME page 78	I/O page 77	PS page 64	VPO page 76	VS page 75	VS_S page 74

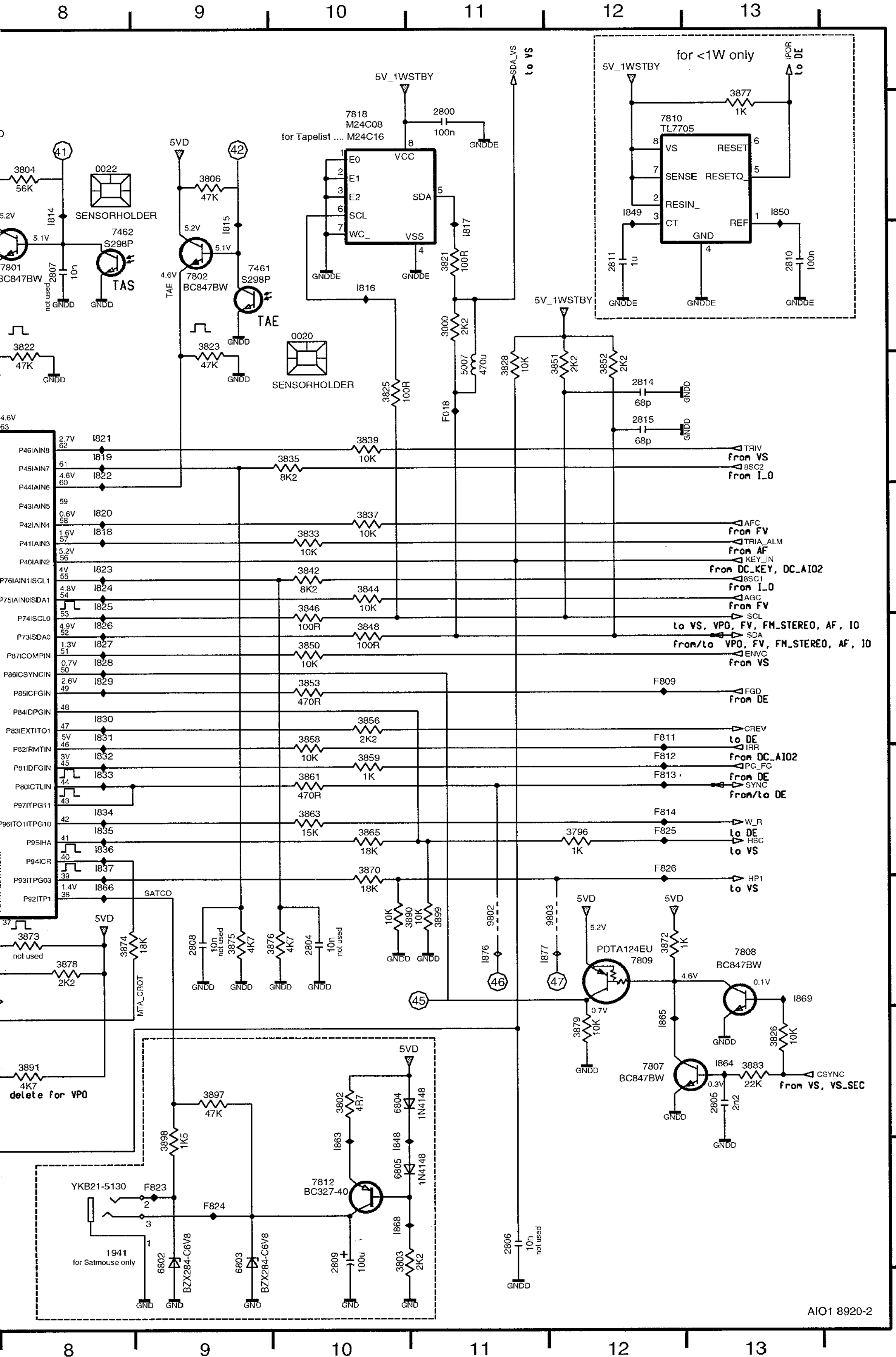
AIO2 8920-4

6 7 8 9

0005	A3
1170	D5
1171	D6
2170	C1
2171	D7
2172	D9
2173	D8
2174	D8
2175	E5
2176	E5
2177	E5
2178	E6
2179	E9
2180	F7
2181	D7
2182	D9
2183	D1
2184	A2
3170	A2
3171	A2
3172	C1
3173	D8
3174	E4
3175	E7
3176	D1
5170	C9
6170	C2
6171	C9
6172	A2
7170	A3
7172	E8
7173	E1
7899-A	C5
C170	E7
F170	B3
F171	A1
F172	C1
F173	E7
F174	D4
F175	C8
F176	C6
F177	C9
I167	C1
I168	D1
I170	C3
I171	C3
I172	C3
I173	C3
I174	C3
I175	C4
I176	C4
I177	C4
I178	C4
I179	C4
I180	C4
I181	C4
I182	C5
I183	C5
I184	C5
I185	C5
I186	C5
I187	C5
I188	C5
I189	C6
I190	C6
I192	D5
I193	D5
I194	D5
I195	D6
I196	E7
I197	E8
I198	D8
I199	C6

7.3 Central control (AIO1)


1
2
3
4
5
6
7
A
B
C
D
E
F
G
H
I
14VM1
from PS 5V_1WSTBY
from PS 5VD
from PS 14VM1
3800 10R
F802
3805 10R
5V_1WSTBY
5VD
14VM1
F803
F804
2803 220u
3808 330R
3809 330R
3810 330R
3811 330R
F827
F828
GNDLED
6460 V298PB
for TAE / TAS
0021 SENSORHOLDER
40
1801 12.3V
7804 BC337-25
1803
1809
3830 220R
GNDLED
5VD
3812 820R
1802 4.9V
BC857BW 7803
4.6V
5V_1WSTBY
3813 10K
10SC12 to from IO
For Projekt50 only
5V_1WSTBY
3801 27K
6801 BAT85
1813
3818 6K8
2801 220p
2802 2n2
GNDD
7800 BC847BW
1805
3807 100K
1804
3814 220R
3815 33K
GNDD
5VD
3867 10K
F810
1801 RECP
GNDD
5V_1WSTBY
3824 10K
3882 10K
1806
1878
1874
9804
WTLD from DE
WTRD from DE
IPOR from DE
FTAD from DE
5V
F805
F806
F807
F808
for <100sec only
3816 470R
3817 470R
3819 10K
3820 470R
4.6V TAS
1807
1808
F800
1810
1811
1812
0.9V 70
69
0.9V 68
4.7V 67
66
P54INT0
P53INT1
P52INT2TI1T0SCK
P51INT3TI2TI4SO
P50INT4TI3TI5SI
P47AIN8
to IO 8SC1M
to IO 8SC1L
to FV PSS
to FV SB1
to FV SFS
to VS CSI
1879
to VS IREV
from FOME FOME
F819
INIT
F817
to PS CSW
to VS MTA_CROT
to DE VISS
to DE TMO
F821
F820
to PS,DC_AIO2,DE STBY
to PS IDISP
ILED
3836 1K
3838 10K
RM
3862 47K
1846
for 16_9 only 3866 1K
1844
3869 1K
1843
3843 1K
1856
3841 1K
1857
3845 1K
1855
3860 4K7
1847
3831 2K2
1862
1859
3840 1K
1858
3864 47K
1845
3847 2K2
1854
3857 10K
MTA
F822
3832 10K
1861
3834 470R
1860
3849 470R
1853
3854 22K
1851
3827 1K
1870
3799 1K
1871
3798 1K
1872
3797 1K
1873
3871 10K
GNDD
4.8V 82 P00
5.2V 83 P01
84 P02
85 P03
86 P04
4.8V 87 P05
88 P06
4.8V 89 P07
90 P10
4.4V 91 P11
4.8V 92 P12
5.1V 93 P13
5.2V 94 P14
95 P15
96 P16
4.8V 97 P17
98 P20
99 P21
100 P22
0V 1 P23
2 P24
1.4V 3 P25
1.4V 4 P26
1.3V 5 P27
7899-B
Central Control-µP
AC3P1-xU
AC3P7-xU
AC3B1-xU
PA0PWM3PVPH
PA3PWM2
PWM0
PWM1
P90TP0G00
32
33 5.1V
34 2.7V
35 1.4V
36 4.8V
5VD
3868 10K
1802 DECK_INIT
GNDD
71
43
56
49
1842
1841
1840
1839
1867
1838
5VD
3880 *1K +0E
+* 1982
F8208
8 F8207
7
6 F8205
5
4
3
2
1
KEY_LED
AN1
Shuttle b4
Shuttle b1
Shuttle b3
Shuttle b2
keyprint + 7811 BC847BW
GND
GND
3855 2K2 + keyprint
1852
3885 *1K2 / +0E
F829
F8204
F8203
F8202
F8201
3892 68K
3893 68K
3894 68K
3895 68K
GNDD
+ .... for Keyprint only
* .... for Shuttle only
3881 18K
HP2
3896 4K7
delete for VPO
3884 not used
3886 3K9
3887 22K
3888 22K
3889 10K
2816 not used
GNDD
2812 33p
GNDFOME
3829 1K for VPO only
F818
F816
F815
24
OSCILLOGRAMS
..V MEASURED IN PLAYBACK MODE
V MEASURED IN RECORD MODE
RMHI to AF
FFP to DE, VS
THIO to DE
CAP to DE
DRUM to DE
OFP to VPO

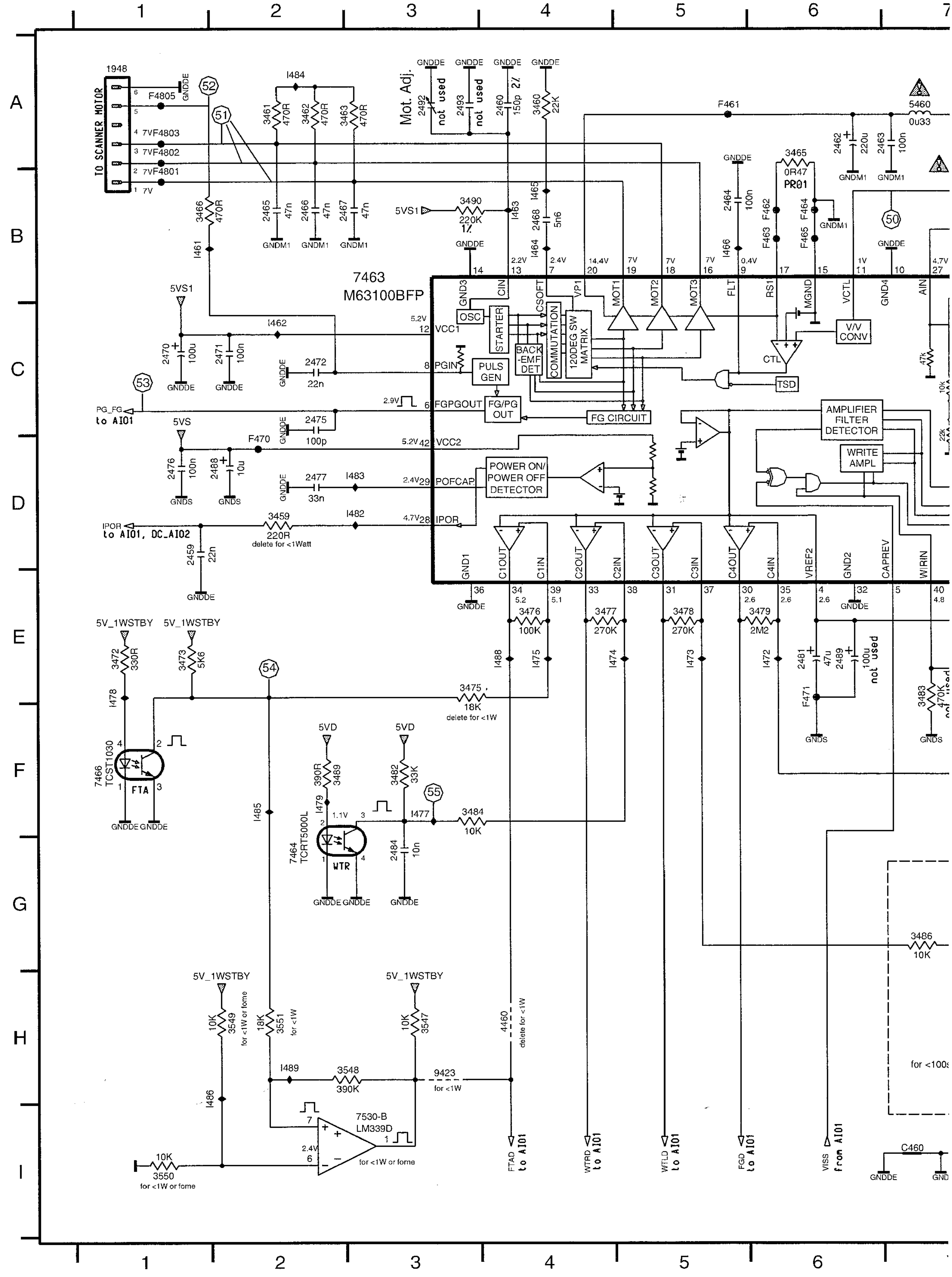

8
9
10
11
12
13
A
B
C
D
E
F
G
H
I
for <1W only
5V_1WSTBY
IPOR
to DE
3877
1K
7810
TL7705
VS
RESET
SENSE
RESETQ
RESIN_
CT
REF
GND
I849
I850
2811
1u
2810
100n
GNDDE
SDA_VS
to VS
5V_1WSTBY
2800
100n
7818
M24C08
for Tapelist M24C16
E0
E1
E2
SCL
WC_
VCC
SDA
VSS
GNDDE
3821
100R
I817
I816
3000
2K2
5007
470u
F018
3825
100R
3828
10K
3851
2K2
3852
2K2
2814
68p
2815
68p
GNDD
3804
56K
41
0022
SENSORHOLDER
I814
7462
S298P
TAS
7801
BC847BW
2807
10n
not used
5.2V
5.1V
5VD
42
3806
47K
I815
7802
BC847BW
4.6V
TAE
7461
S298P
TAE
3822
47K
3823
47K
0020
SENSORHOLDER
4.6V
63
P46IAIN8
P45IAIN7
P44IAIN6
P43IAIN5
P42IAIN4
P41IAIN3
P40IAIN2
P76IAIN1ISCL1
P75IAIN0ISDA1
P74ISCL0
P73ISDA0
P87ICOMPIN
P86ICSYNCIN
P85ICFGIN
P84IDPGIN
P83IEXTITO1
P82IRMTIN
P81IDFGIN
P80ICTLIN
P97ITPG11
P96ITO1ITPG10
P95IHA
P94ICR
P93ITPG03
P92ITP1
2.7V
4.6V
0.6V
1.6V
5.2V
4V
4.8V
4.9V
1.3V
0.7V
2.6V
5V
3V
1.4V
I821
I819
I822
I820
I818
I823
I824
I825
I826
I827
I828
I829
I830
I831
I832
I833
I834
I835
I836
I837
I866
3839
10K
3835
8K2
3837
10K
3833
10K
3842
8K2
3844
10K
3846
100R
3848
100R
3850
10K
3853
470R
3856
2K2
3858
10K
3859
1K
3861
470R
3863
15K
3865
18K
3796
1K
3870
18K
F809
F811
F812
F813
F814
F825
F826
TRIV
from VS
8SC2
from I_O
AFC
from FV
TRIA_ALM
from AF
KEY_IN
from DC_KEY, DC_AIO2
8SC1
from I_O
AGC
from FV
SCL
to VS, VPO, FV, FM_STEREO, AF, IO
SDA
from/to VPO, FV, FM_STEREO, AF, IO
ENVC
from VS
FGD
from DE
CREV
to DE
IRR
from DC_AIO2
PG_FG
from DE
SYNC
from/to DE
W_R
to DE
HSC
to VS
HP1
to VS
SATCO
2808
10n
not used
3875
4K7
3876
4K7
2804
10n
not used
3890
10K
3899
10K
9802
9803
I876
I877
46
47
45
5VD
5.2V
PDTA124EU
7809
3872
1K
4.6V
7808
BC847BW
0.1V
I869
0.7V
3879
10K
I865
3826
10K
7807
BC847BW
I864
3883
22K
0.3V
CSYNC
from VS, VS_SEC
2805
2n2
3873
not used
3878
2K2
5VD
3874
18K
MTA_CROT
3891
4K7
delete for VPO
3897
47K
3898
1K5
YKB21-5130
F823
F824
1941
for Satmouse only
6802
BZX284-C6V8
6803
BZX284-C6V8
3802
4R7
6804
1N4148
I863
I848
6805
1N4148
7812
BC327-40
I868
2809
100u
3803
2K2
2806
10n
not used
GND
GNDD
AIO1 8920-2

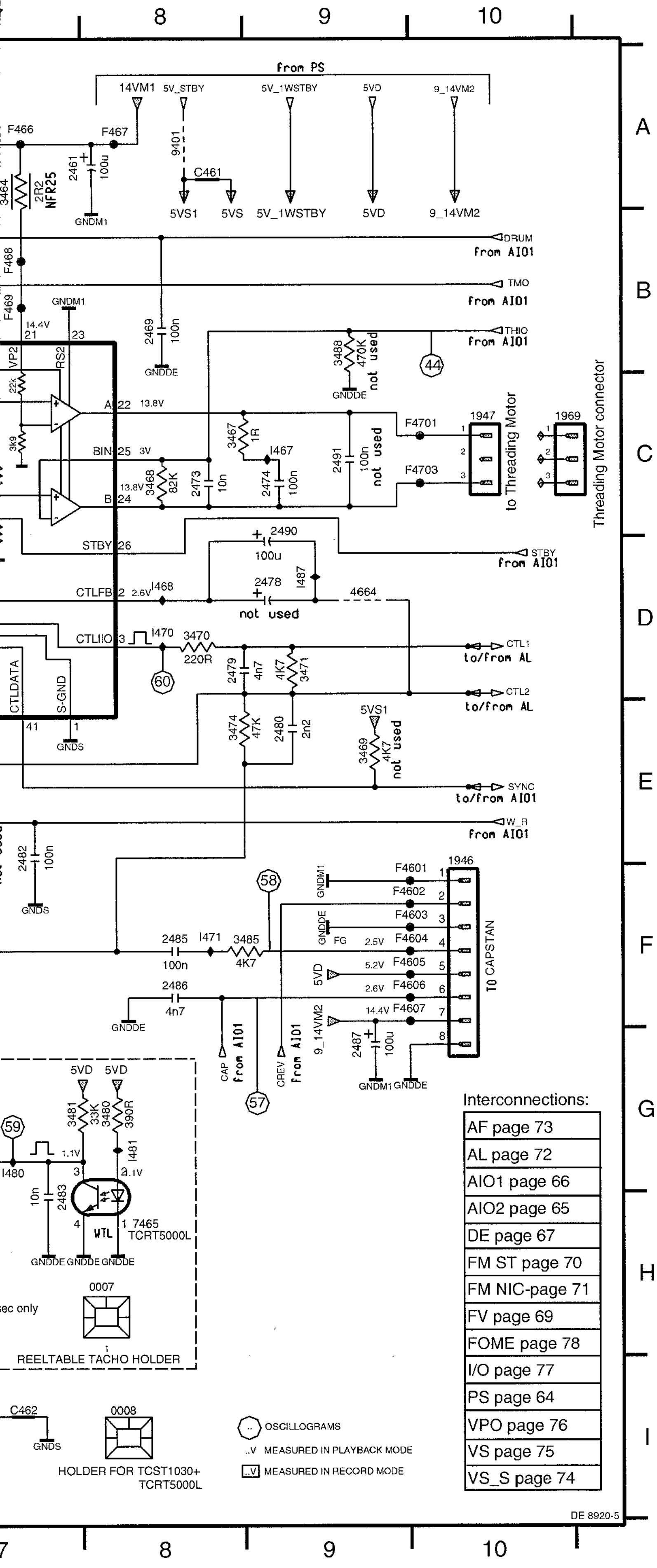
0020	B10	3896	H6
0021	B1	3897	H9
0022	A8	3898	I9
0030	I13	3899	G11
0031	I13	5007	C11
0060	H12	6460	B1
0061	I12	6801	A4
0062	I12	6802	I9
1801	C4	6803	I9
1802	G1	6804	H10
1941	I8	6805	I10
1982	H1	7461	B10
2800	A11	7462	B9
2801	A3	7800	B3
2802	A5	7801	B8
2803	B1	7802	B9
2804	G10	7803	C2
2805	H13	7804	C1
2806	I11	7807	H12
2807	B8	7808	G13
2808	G9	7809	G12
2809	I10	7810	A12
2810	B13	7811	H2
2811	B12	7812	I10
2812	I6	7818	A10
2814	C12	7899-B	E7
2815	C12	9802	G11
2816	H7	9803	G12
3000	B11	9804	A6
3796	F12	F018	C11
3797	F5	F800	C7
3798	F5	F802	A1
3799	F5	F803	A1
3800	A1	F804	A1
3801	A4	F805	A6
3802	H10	F806	A6
3803	I10	F807	A7
3804	A8	F808	A7
3805	A1	F809	E12
3806	A9	F810	B4
3807	A4	F811	E12
3808	B1	F812	F12
3809	B1	F813	F12
3810	B1	F814	F12
3811	B2	F815	I7
3812	B2	F816	I7
3813	B2	F817	E3
3814	B3	F818	I6
3815	B3	F819	E1
3816	B6	F820	E2
3817	B6	F8201	I1
3818	A4	F8202	I1
3819	B7	F8203	I1
3820	B7	F8204	H1
3821	B11	F8205	H1
3822	B8	F8207	H1
3823	B9	F8208	H1
3824	C5	F821	E2
3825	C10	F822	E5
3826	H13	F823	I9
3827	F5	F824	I9
3828	C11	F825	F12
3829	I7	F826	F12
3830	C1	F827	B1
3831	D5	F828	B1
3832	E5	F829	H2
3833	D10	I801	C1
3834	E5	I802	B2
3835	C10	I803	C1
3836	E3	I804	B3
3837	D10	I805	B3
3838	C5	I806	C5
3839	C10	I807	C6
3840	E5	I808	C6
3841	D5	I809	C1
3842	D10	I810	C7
3843	D5	I811	C7
3844	D10	I812	C7
3845	D5	I813	A4
3846	D10	I814	A8
3847	E5	I815	B9
3848	E10	I816	B10
3849	F5	I817	B11
3850	E10	I818	D8
3851	C12	I819	C8
3852	C12	I820	D8
3853	E10	I821	C8
3854	F5	I822	C8
3855	H2	I823	D8
3856	E10	I824	D8
3857	E5	I825	D8
3858	E10	I826	E8
3859	F10	I827	E8
3860	D5	I828	E8
3861	F10	I829	E8
3862	C5	I830	E8
3863	F10	I831	E8
3864	E5	I832	F8
3865	F10	I833	F8
3866	D5	I834	F8
3867	B4	I835	F8
3868	F1	I836	F8
3869	D5	I837	F8
3870	F10	I838	G7
3871	G5	I839	G7
3872	G12	I840	G7
3873	G8	I841	G6
3874	G8	I842	G6
3875	G9	I843	D5
3876	G10	I844	D5
3877	A13	I845	E5
3878	G8	I846	C5
3879	H12	I847	D5
3880	H1	I848	I10
3881	H5	I849	A12
3882	C5	I850	A13
3883	H13	I851	F5
3884	H6	I852	H2
3885	H2	I853	F5
3886	H6	I854	E5
3887	H6	I855	D5
3888	H7	I856	D5
3889	H7	I857	D5
3890	G10	I858	E5
3891	H8	I859	E5
3892	I1	I860	E5
3893	I2	I861	E5
3894	I2	I862	D5
3895	I2	I863	I10

Interconnections:

AF page 73	AL page 72	AIO1 page 66	AIO2 page 65	DE page 67	FM ST page 70	FM NIC-page 71
FV page 69	FOME page 78	I/O page 77	PS page 64	VPO page 76	VS page 75	VS_S page 74

7.4 Deck control (DE)


1948
TO SCANNER MOTOR
F4805
7VF4803
7VF4802
7VF4801
7V
GNDDE
(52)
(51)
(53)
(54)
(55)
(50)
1484
3461 470R
3462 470R
3463 470R
3466 470R
2465 47n
2466 47n
2467 47n
GNDM1
1461
Mot. Adj.
2492 not used
2493 not used
2460 150p 2%
3460 22K
5VS1
3490 220K 1%
1463
1465
2468 5n6
1464
F461
5460 0u33
2462 220u
2463 100n
3465 0R47 PR01
2464 100n
F462
F463
F464
F465
1466
GNDM1
7463
M63100BFP
GND3
CIN
CSOFT
VP1
MOT1
MOT2
MOT3
FLT
RS1
MGND
VCTL
GND4
AIN
OSC
STARTER
COMMUTATION
120DEG SW MATRIX
BACK -EMF DET
PULS GEN
FG/PG OUT
FG CIRCUIT
CTL
V/V CONV
TSD
AMPLIFIER FILTER DETECTOR
WRITE AMPL
POWER ON/ POWER OFF DETECTOR
VCC1
PGIN
FGPGOUT
VCC2
POFCAP
IPOR
1462
2470 100u
2471 100n
2472 22n
PG_FG to AI01
5VS
2475 100p
F470
2476 100n
2488 10u
GNDS
2477 33n
1483
1482
IPOR to AI01, DC_AI02
3459 220R delete for <1Watt
2459 22n
GND1
C1OUT
C1IN
C2OUT
C2IN
C3OUT
C3IN
C4OUT
C4IN
VREF2
GND2
CAPREV
WIRIN
3476 100K
3477 270K
3478 270K
3479 2M2
1488
1475
1474
1473
1472
2481 47u
2489 100u not used
F471
3483 470K
5V_1WSTBY
3472 330R
3473 5K6
1478
7466 TCST1030
FTA
3475 18K delete for <1W
5VD
3489 390R
3482 33K
1479
7464 TCRT5000L
WTR
1477
3484 10K
2484 10n
1485
3486 10K
3549 10K for <1W or fome
3551 18K for <1W
3547 10K
4460 delete for <1W
1489
3548 390K
9423 for <1W
1486
7530-B LM339D
for <1W or fome
3550 10K for <1W or fome
FTAD to AI01
WTRD to AI01
WTLD to AI01
FGD to AI01
VISS from AI01
C460
for <100
1 2 3 4 5 6 7
A B C D E F G H I


7
8
9
10
from PS
14VM1
5V_STBY
5V_1WSTBY
5VD
9_14VM2
F466
F467
9401
2461
100u
C461
3464
2R2
NFR25
GNDM1
5VS1
5VS
5V_1WSTBY
5VD
9_14VM2
DRUM
from AI01
F468
TMO
from AI01
F469
GNDM1
14.4V
21
23
2469
100n
THIO
from AI01
VP2
RS2
GNDDE
3488
470K
not used
44
22k
A 22
13.8V
GNDDE
3467
1R
F4701
1947
1969
3k9
BIN 25
3V
I467
2491
100n
not used
F4703
to Threading Motor
Threading Motor connector
13.8V
3468
82K
2473
10n
2474
100n
B 24
STBY 26
2490
100u
STBY
from AI01
I487
2478
CTLFB 2
2.6V
I468
4664
not used
CTLIIO 3
I470
3470
220R
CTL1
to/from AL
60
2479
4n7
4K7
3471
CTLDATA
S-GND
CTL2
to/from AL
41
1
GNDS
3474
47K
2480
2n2
5VS1
3469
4K7
not used
SYNC
to/from AI01
W_R
from AI01
2482
100n
GNDS
1946
F4601
GNDM1
58
F4602
F4603
GNDDE
FG
2.5V
F4604
2485
I471
3485
100n
4K7
TO CAPSTAN
5VD
5.2V
F4605
2486
2.6V
F4606
4n7
GNDDE
14.4V
F4607
9_14VM2
2487
100u
CAP
from AI01
CREV
from AI01
GNDM1
GNDDE
57
5VD
5VD
3481
33K
3480
390R
59
I481
1.1V
2.1V
I480
10n
2483
3
4
1
7465
TCRT5000L
WTL
GNDDE
GNDDE
GNDDE
0007
sec only
REELTABLE TACHO HOLDER
C462
0008
GNDS
HOLDER FOR TCST1030+
TCRT5000L
OSCILLOGRAMS
..V MEASURED IN PLAYBACK MODE
..V MEASURED IN RECORD MODE
DE 8920-5
A
B
C
D
E
F
G
H
I

Interconnections:

- AF page 73
- AL page 72
- AIO1 page 66
- AIO2 page 65
- DE page 67
- FM ST page 70
- FM NIC-page 71
- FV page 69
- FOME page 78
- I/O page 77
- PS page 64
- VPO page 76
- VS page 75
- VS_S page 74

0007	H8
0008	I8
0011	H9
1946	F10
1947	C10
1948	A1
1969	H8
2459	D1
2460	A4
2461	A7
2462	A6
2463	A7
2464	B5
2465	B2
2466	B2
2467	B3
2468	B4
2469	B8
2470	C1
2471	C2
2472	C2
2473	C8
2474	C9
2475	C2
2476	D1
2477	D2
2478	D9
2479	D8
2480	E9
2481	E6
2482	E7
2483	H7
2484	G3
2485	F8
2486	F8
2487	G9
2488	D2
2489	E6
2490	C9
2491	C9
2492	A3
2493	A3
3459	D2
3460	A4
3461	A2
3462	A2
3463	A3
3464	A7
3465	A6
3466	B1
3467	C8
3468	C8
3469	E9
3470	D8
3471	D9
3472	E1
3473	E1
3474	E8
3475	E3
3476	E4
3477	E4
3478	E5
3479	E6
3480	G8
3481	G7
3482	F3
3483	E7
3484	F3
3485	F9
3486	G7
3488	B9
3489	F2
3490	B3
3547	H3
3548	H3
3549	H2
3550	I1
3551	H2
4460	H4
4664	D9
5460	A7
7463	B3
7464	G2
7465	H8
7466	F1
7530-B	I3
9401	A8
9423	H3
C460	I7
C461	A8
C462	I7
F4601	F10
F4602	F9
F4603	F10
F4604	F10
F4605	F9
F4606	F9
F4607	F9
F461	A5
F462	B6
F463	B6
F464	B6
F465	B6
F466	A7
F467	A8
F468	B7
F469	B7
F470	D2
F4701	C10
F4703	C10
F471	E6
F4801	B1
F4802	A1
F4803	A1
F4805	A1
I028	H8
I029	H8
I030	H8
I461	B1
I462	C2
I463	B4
I464	B4
I465	B4
I466	B5
I467	C9
I468	D8
I470	D8
I471	F8
I472	E6
I473	E5
I474	E4
I475	E4
I477	F3
I478	E1
I479	F2
I480	G7
I481	G8
I482	D3
I483	D3
I484	A2
I485	F2
I486	H1
I487	D9
I488	E4
I489	H2

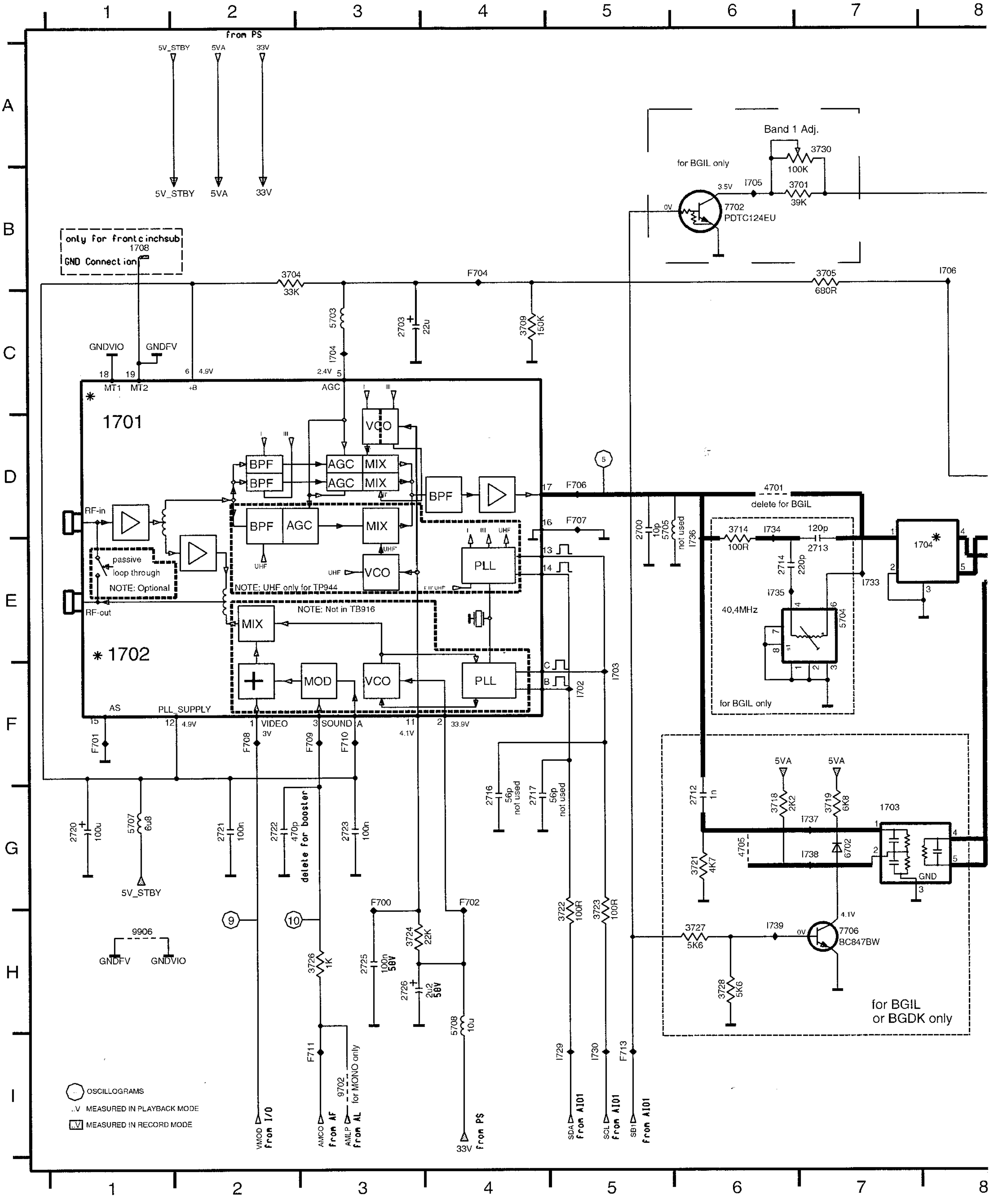
7.5 Variant List Frontend (FV)

	MONO							
	PAL BG	**PAL I UHF only**	**PAL I fullband**	**PAL, BG/I, SEC L/L'**	**PAL, SEC BG/I/DK**	**PAL, SEC, BG/DK**	**PAL,SEC DK (K1)**	**PAL, BG/I/ SEC L/**
	/02	**/05**	**/07**	**/39**	**/55**	**/58**	**/60**	**prepare**
Pos.	FM Interc.	FM Interc.	FM Interc.	FM, AM QSS	FM QSS	FM QSS	FM Interc.	FM, AM Q
1701	TP916MKII	TP944MKII	-	TP926MKII	-	-	TP926MKII	TP926M
1701	TMRG1-108A	TMRB1-102A	TMRG1-110A	TMRG2-104A	TMRG1-203A	TMRG1-203A	TMRG2-104A	TMRG2-1
1701	TCBZ4-002A	TCBB1-001A	TCBZ4-002A	TCBZ4-004A	TCBZ4-002A	TCBZ4-002A	TCBZ4-004A	TCBZ4-0
1703	-	-	-	K9656M	K9656M	K9656M	-	K9656
1704	G1961M	J1980M	J1980M	K3953M	G3956M	G3956M	K2955M	K3953
1705	TPS 5,5	double TRAP TPW6,0/6,5	double TRAP TPW6,0/6,5	TPS 5,5	TPS 5,5	TPS 5,5	TPS 6,5	TPS 5,
1706	EFC 5,5	EFC 6,0	EFC 6,0	EFC 5,5	EFC 5,5	EFC 5,5	EFC 6,5	EFC 5,
1766					EFC 6,5			EFC 6,
1707	-	-	-	EFC 6,0	EFC 6,0	EFC 6,5	-	EFC 6,
2707	-	-	-	100n	-	-	-	100n
2712	-	-	-	1n	1n	1n	-	1n
2713	-	-	-	120p	-	-	-	120p
2714	-	-	-	220p	-	-	-	220p
2718	22n	22n	22n	22n	22n	22n	22n	22n
2719	22u	22u	22u	22u	22u	22u	22u	22u
2722	470p	470p	470p	-	470p	470p		-
2795	-	-	-	-	-	-	-	-
3710	-	-	-	220E	220E	220E	-	220E
3711	-	-	-	3k3	3k3	3k3	-	3k3
3714	-	-	-	100E	-	-	-	100E
3715	330E	220E	220E	220E	220E	220E	270E	220E
3716	-	-	-	2k2	2k2	2k2	-	2k2
3717	2k7	2k7	2k7	2k7	2k7	2k7	2k7	2k7
3718	-	-	-	2k2	-	-	-	2k2
3719	-	-	-	6k8	-	-	-	6k8
3720	470E	470E	470E	470E	470E	470E	470E	470E
3721	-	-	-	4k7	-	-	-	4k7
3725	-	-	-	470E	470E	470E	-	470E
3726	1k	1k	1k	-	1k	1k	1k	-
3727	-	-	-	5k6	-	-	-	5k6
3728	-	-	-	5k6	-	-	-	5k6
3729	-	-	-	-	-	-	-	-
3701	-	-	-	39k	-	-	-	39k
3730	-	-	-	100k	-	-	-	100k
4701	0E	0E	0E	-	0E	0E	0E	-
4702	0E	0E	0E	-	-	-	0E	-
4703	0E	0E	0E	-	-	-	0E	-
4704	-	-	-	-	-	-	-	-
4705	-	-	-	-	0E	0E	-	-
5701	15uH	10uH	10uH	10uH	10uH	10uH	15uH	10uH
5704	-	-	-	41645	-	-	-	41645
5710	-	-	-	-	-	-	-	-
6702	-	-	-	BA792	-	-	-	BA792
7701	-	-	-	HEF4053	HEF4053	HEF4053	-	HEF405
7702	-	-	-	PDTC124EU	-	-	-	PDTC124
7705	TDA 9817 T	TDA 9817 T	TDA 9817 T	TDA 9818 T	TDA 9817 T	TDA 9817 T	TDA 9817 T	TDA 981
7706	-	-	-	BC847BW	-	-	-	BC847B
9701	0E	0E	0E	-	-	-	0E	-
9702	0E	0E	0E	0E	0E	0E	0E	0E

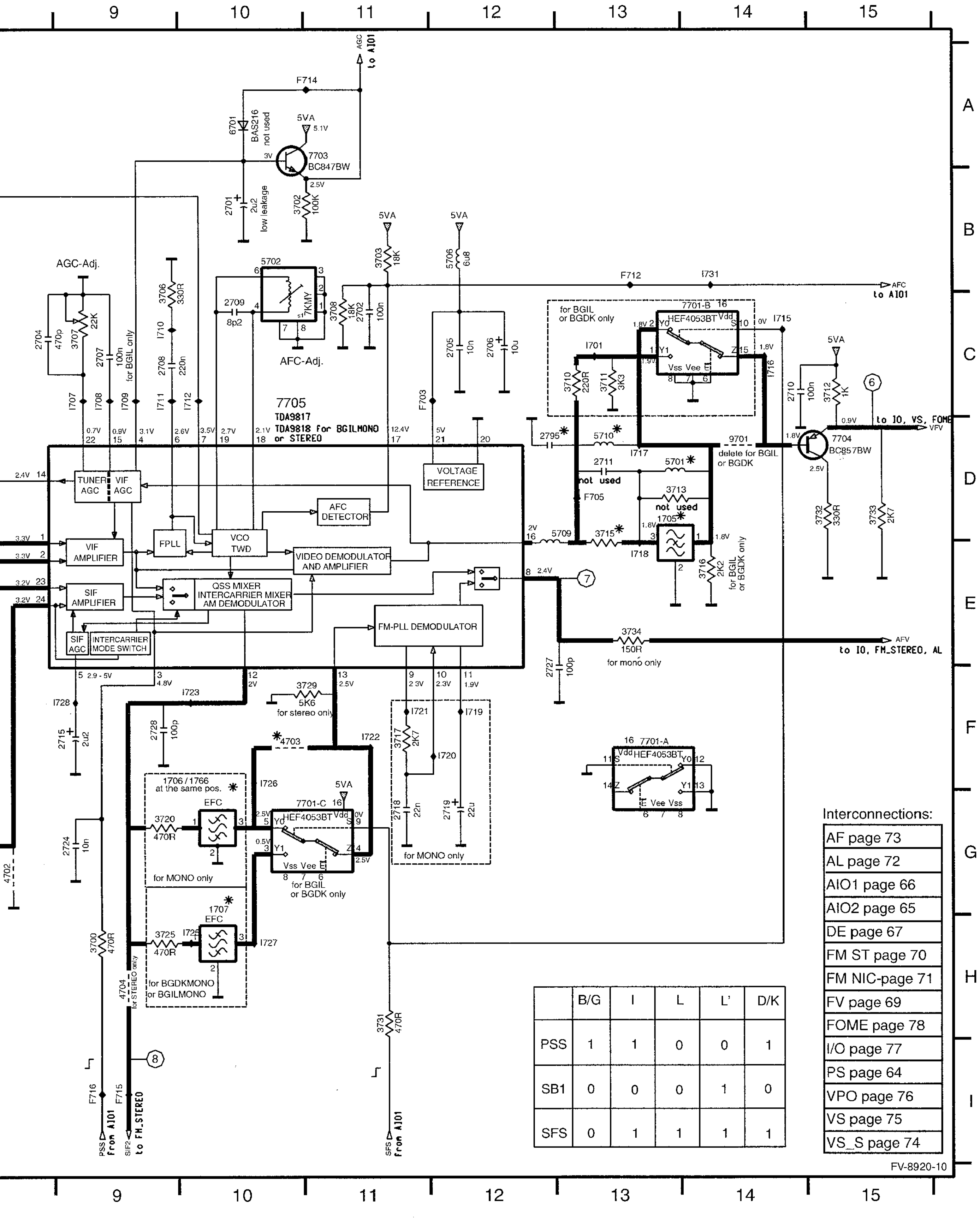
	STEREO						
DK, ’	**PAL BG**	**PAL I fullband**	**PAL BG**	**PAL, SEC BG/I/DK, L/L’**	**PAL,SEC BG/DK**	**PAL,SEC DK (K1)**	
d	**/02**	**/07**	**/13, /16**	**/39**	**/58**	**/60**	
SS	FM Interc.	FM, NICAM QSS	FM, NICAM QSS	FM, AM, NICAM QSS	FM, NICAM QSS	FM, NICAM QSS	**FUNCTION**
KII	TP916MKII	-	TP916MKII	TP926MKII	-	TP926MKII	TUMOD PHILIPS
4A	TMRG1-108A	TMRG1-110A	TMRG1-108A	TMRG2-104A	TMRG1-203A	TMRG2-104A	TUMOD ALPS old
4A	TCBZ4-002A	TCBZ4-002A	TCBZ4-002A	TCBZ4-004A	TCBZ4-002A	TCBZ4-004A	TUMOD ALPS new
	-	K9656M	K9656M	K9656M	K9656M	K9656M	QSS Sound OFW
	G1984M	K3953M	G3956M	K3953M	G3956M	G3956M	2. QSS Video OFW
	TPS 5,5	double TRAP TPW6,0/6,5	TPS 5,5	TPS 5,5	TPS 5,5	TPS 6,5	Video-TRAP
	-	-	-	-	-	-	1. Sound-Filter
							1’. Sound filter DK
	-	-	-	-	-	-	2. Sound-Filter
	-	-	-	100n	-	-	VIF AGC TDA 9818T only
	-	1n	1n	1n	1n	1n	QSS Sound OFW coupling
	-	-	-	120p	-	-	40,4 trap
	-	-	-	220p	-	-	40,4 trap
	-	-	-	-	-	-	Deemphasis MONO
	-	-	-	-	-	-	FM PLL Demodulator
	470p	470p	470p	-	470p		sieve Audio Modulator IN
	15p	-	-		-	-	Video Trap widen
	-	-	-	220E	220E	-	Video Trap Bypass
	-	-	-	3k3	3k3	-	Video-Amplitude Multistdt.
	-	-	-	100E	-	-	40,4 trap
	330E	220E	330E	220E	220E	270E	Video Trap resistor
	-	-	-	2k2	2k2	-	Video Trap resistor
	-	-	-	-	-	-	Deemphasis MONO
	-	-	-	2k2	-	-	Sound OFW switch
	-	-	-	6k8	-	-	Sound OFW switch
	-	-	-	-	-	-	EFC resistor
	-	-	-	4k7	-	-	Sound OFW switch
	-	-	-	-	-	-	2. EFC resistor
	1k	1k	1k	-	1k	1k	Audio IN Modulator
	-	-	-	5k6	-	-	Sound OFW switch
	-	-	-	5k6	-	-	Sound OFW switch
	5k6	5k6	5k6	5k6	5k6	5k6	Mute FM Demodulator
	-	-	-	39k	-	-	SEC band 1 Adj.
	-	-	-	100k	-	-	SEC band 1 Adj.
	0E	0E	0E	-	0E	0E	40,4 Falle Bypass
	0E	-	-	-	-	-	Intercarier switch
	-	-	-	-	-	-	4053 Bypass
	0E	0E	0E	0E	0E	0E	SIF to MSP
	-	0E	0E	-	0E	0E	QSS OFW BG/I/DK select
	15uH	10uH	15uH	10uH	10uH	15uH	Video trap coil
	-	-	-	41645	-	-	40,4 trap
	39u	-	-	-	-	-	Video trap widen
	-	-	-	BA792	-	-	Sound OFW switch
	-	-	-	HEF4053	HEF4053	-	EFC / TRAP switch
EU	-	-	-	PDTC124EU	-	-	AFC L’
T	TDA 9817 T	TDA 9817 T	TDA 9817 T	TDA 9818 T	TDA 9817 T	TDA 9817 T	AV Demodulator
	-	-	-	BC847BW	-	-	Sound OFW switch
	0E	0E	0E	-	-	0E	4053 Bypass
	-	-	-	-	-	-	MONO Audio to Modulator

7.6 Frontend (FV)

1701 D1	1707 G10	2704 C8	2710 C14	2716 G4	2722 G2	2728 F9	3704 B2	3710 C13	3716 E14	3722 H5	3728 H6	3734 E13	5
1702 E1	1708 C1	2705 C12	2711 D13	2717 G4	2723 G3	2795 D12	3705 B7	3711 C13	3717 F11	3723 H5	3729 F11	4701 D6	5
1703 G7	2700 D5	2706 C12	2712 G6	2718 G11	2724 G9	3700 H9	3706 C9	3712 C15	3718 G6	3724 H3	3730 A7	4702 G8	5
1704 E7	2701 B10	2707 C9	2713 E7	2719 G12	2725 H3	3701 B7	3707 C9	3713 D13	3719 G7	3725 H9	3731 H11	4703 F10	5
1705 D13	2702 C11	2708 C9	2714 E6	2720 G1	2726 H3	3702 B10	3708 C11	3714 D6	3720 G9	3726 H3	3732 D15	4704 H9	5
1706 G10	2703 C3	2709 C10	2715 F9	2721 G2	2727 F12	3703 B11	3709 C4	3715 D13	3721 G6	3727 H6	3733 D15	4705 G6	5


1
2
3
4
5
6
7
8
A
B
C
D
E
F
G
H
I
from PS
5V_STBY
5VA
33V
5V_STBY
5VA
33V
Band 1 Adj.
3730
100K
for BGIL only
3.5V
1705
3701
39K
0V
7702
PDTC124EU
only for frontcinchsub
1708
GND Connection
3704
33K
F704
3705
680R
1706
5703
2703
22u
3709
150K
1704
GNDVIO
GNDFV
18
19
6
4.9V
2.4V
5
MT1
MT2
+B
AGC
1701
VCO
BPF
AGC
MIX
BPF
AGC
MIX
BPF
BPF
AGC
MIX
UHF
VCO
PLL
RF-in
passive
loop through
NOTE: Optional
RF-out
NOTE: UHF only for TP944
NOTE: Not in TB916
MIX
1702
MOD
VCO
PLL
17
F706
16
F707
13
14
C
B
AS
PLL_SUPPLY
15
12
4.9V
1
VIDEO
3V
3
SOUND
A
11
4.1V
2
33.9V
F701
F708
F709
F710
1703
1702
5
4701
delete for BGIL
2700
10p
5705
not used
1736
3714
100R
1734
120p
2713
2714
220p
1735
40,4MHz
5704
for BGIL only
1704
1733
1
2
3
4
5
2720
100u
5707
6u8
2721
100n
2722
470p
delete for booster
2723
100n
2716
56p
not used
2717
56p
not used
5V_STBY
2712
1n
5VA
5VA
3718
2K2
3719
6K8
1737
1703
4705
1738
6702
3721
4K7
GND
9906
GNDFV
GNDVIO
9
10
F700
F702
3724
22K
2725
100n
50V
2726
2u2
50V
3726
1K
5708
10u
3722
100R
3723
100R
3727
5K6
1739
0V
4.1V
7706
BC847BW
3728
5K6
for BGIL
or BGDK only
F711
9702
for MONO only
1729
1730
F713
OSCILLOGRAMS
..V MEASURED IN PLAYBACK MODE
..V MEASURED IN RECORD MODE
VMOD
from I/O
AMCO
from AF
AMLP
from AL
33V
from PS
SDA
from AIO1
SCL
from AIO1
SB1
from AIO1

701	D13
702	B10
703	C3
704	E7
705	D5
706	B12
5707	G1
5708	H4
5709	D12
5710	D13
6701	A10
6702	G7
7701-A	F13
7701-B	C14
7701-C	G11
7702	B6
7703	A11
7704	D15
7705	C10
7706	H7
9701	D14
9702	I3
9906	H1
F700	G3
F701	F1
F702	G4
F703	C11
F704	B4
F705	D13
F706	D5
F707	D5
F708	F2
F709	F3
F710	F3
F711	I3
F712	B13
F713	I5
F714	A11
F715	I9
F716	I9
I701	C13
I702	F5
I703	F5
I704	C3
I705	B6
I706	B8
I707	C9
I708	C9
I709	C9
I710	C9
I711	C9
I712	C10
I715	C14
I716	C14
I717	D13
I718	E13
I719	F12
I720	F12
I721	F11
I722	F11
I723	F10
I724	G10
I725	H10
I726	F10
I727	H10
I728	F9
I729	I5
I730	I5
I731	B14
I733	E7
I734	D6
I735	E6
I736	E6
I737	G7
I738	G7
I739	H6

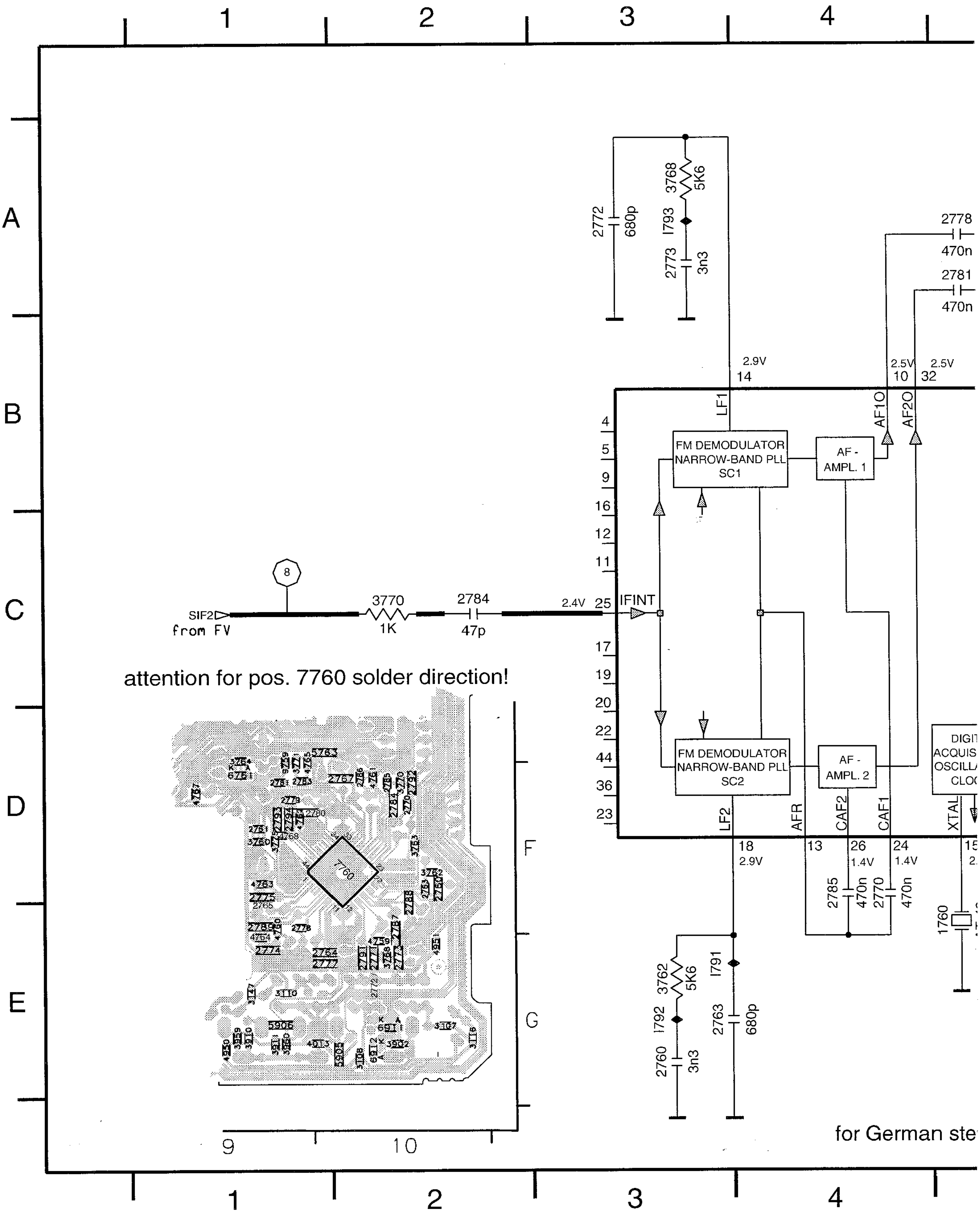

9
10
11
12
13
14
15
A
B
C
D
E
F
G
H
I
AGC
to AI01
F714
6701
BAS216
not used
5VA
5.1V
3V
7703
BC847BW
2.5V
2701
2u2
low leakage
3702
100K
5VA
3703
18K
5VA
5706
6u8
AGC-Adj.
2704
470p
3707
22K
2707
100n
for BGIL only
3706
330R
I710
2708
220n
5702
6
3
2
1
4
7
8
7KMY
2709
8p2
3708
18K
2702
100n
AFC-Adj.
2705
10n
2706
10u
F712
I731
AFC
to AI01
for BGIL
or BGDK only
7701-B
16
HEF4053BT
Vdd
1.8V
Y0
S
10
0V
I715
I701
1
Y1
1.9V
Z
15
1.8V
Vss
Vee
E
8
7
6
3710
220R
3711
3K3
I716
5VA
2710
100n
3712
1K
6
0.9V
to IO, VS, FOME
VFV
I707
I708
I709
I711
I712
F703
7705
TDA9817
TDA9818 For BGILMONO
or STEREO
0.7V
22
0.9V
15
3.1V
4
2.6V
6
3.5V
7
2.7V
19
2.1V
18
12.4V
17
5V
21
20
2795
5710
9701
delete for BGIL
or BGDK
1.8V
7704
BC857BW
2.5V
I717
2711
not used
5701
3713
not used
F705
1705
1.8V
3
1
2
2.4V
14
TUNER
AGC
VIF
AGC
VOLTAGE
REFERENCE
AFC
DETECTOR
3.3V
1
3.3V
2
VIF
AMPLIFIER
FPLL
VCO
TWD
VIDEO DEMODULATOR
AND AMPLIFIER
2V
16
5709
3715
I718
1.8V
3716
2K2
for BGIL
or BGDK only
3732
330R
3733
2K7
3.2V
23
3.2V
24
SIF
AMPLIFIER
QSS MIXER
INTERCARRIER MIXER
AM DEMODULATOR
8
2.4V
7
SIF
AGC
INTERCARRIER
MODE SWITCH
FM-PLL DEMODULATOR
3734
150R
for mono only
AFV
to IO, FM_STEREO, AL
2727
100p
5
2.9 - 5V
3
4.8V
12
2V
13
2.5V
9
2.3V
10
2.3V
11
1.9V
I728
I723
3729
5K6
for stereo only
I721
I719
2715
2u2
2728
100p
4703
I722
3717
2K7
I720
2718
22n
2719
22u
for MONO only
16
7701-A
Vdd
HEF4053BT
11
S
Y0
12
14
Z
Y1
13
E
Vee
Vss
6
7
8
1706 / 1766
at the same pos.
EFC
3720
470R
1
3
2
I726
5VA
7701-C
16
HEF4053BT
Vdd
2.5V
5
Y0
0V
S
9
0.5V
3
Y1
Z
4
2.5V
Vss
Vee
E
8
7
6
for BGIL
or BGDK only
2724
10n
for MONO only
4702
1707
EFC
3725
470R
I725
3
2
I727
3700
470R
4704
for STEREO only
for BGDKMONO
or BGILMONO
3731
470R
8
F716
PSS
from AI01
F715
SIF2
to FM_STEREO
SFS
from AI01
FV-8920-10

	B/G	I	L	L'	D/K
PSS	1	1	0	0	1
SB1	0	0	0	1	0
SFS	0	1	1	1	1

Interconnections:

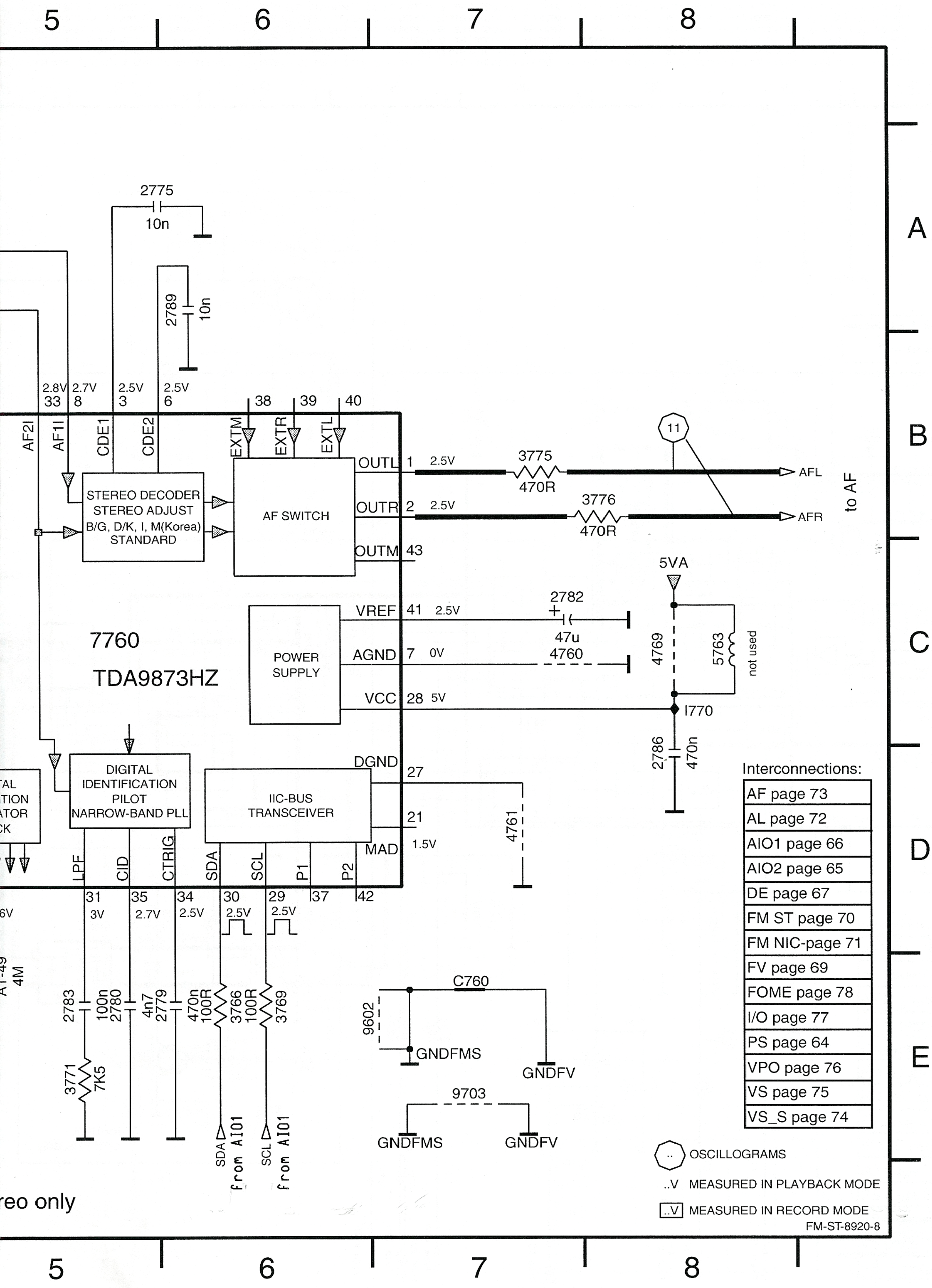
AF page 73
AL page 72
AIO1 page 66
AIO2 page 65
DE page 67
FM ST page 70
FM NIC-page 71
FV page 69
FOME page 78
I/O page 77
PS page 64
VPO page 76
VS page 75
VS_S page 74

7.7 FM stereo (FM-ST)


1
2
3
4
A
B
C
D
E
2772
680p
3768
5K6
I793
2773
3n3
2778
470n
2781
470n
2.9V
14
2.5V
10
2.5V
32
LF1
AF1O
AF2O
FM DEMODULATOR
NARROW-BAND PLL
SC1
AF -
AMPL. 1
4
5
9
16
12
11
8
SIF2
from FV
3770
1K
2784
47p
2.4V
25
IFINT
17
19
20
22
44
36
23
FM DEMODULATOR
NARROW-BAND PLL
SC2
AF -
AMPL. 2
LF2
AFR
CAF2
CAF1
XTAL
18
2.9V
13
26
1.4V
24
1.4V
2785
470n
2770
470n
1760
3762
5K6
I791
I792
2763
680p
2760
3n3
7760
F
G
9
10

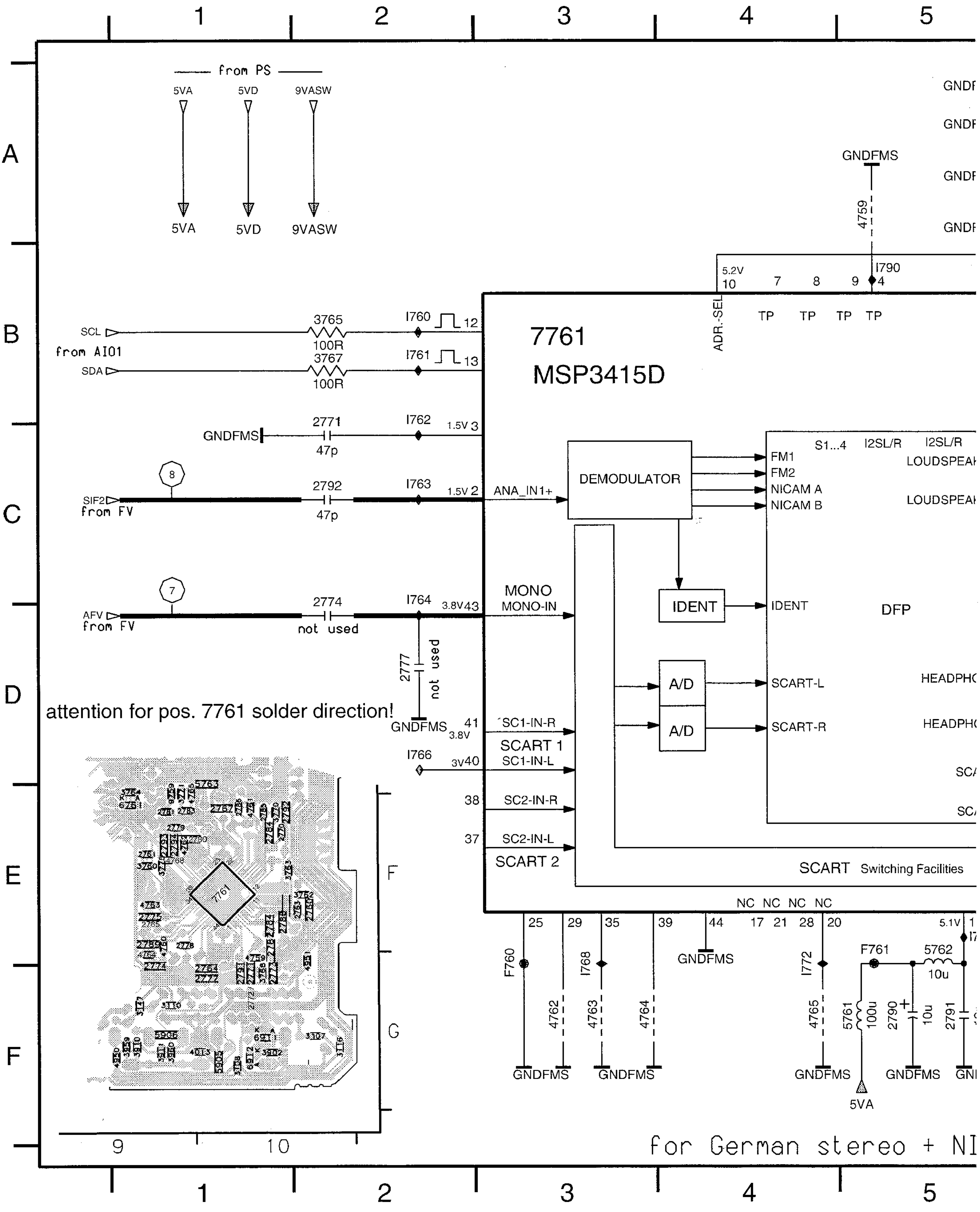
attention for pos. 7760 solder direction!

for German ste

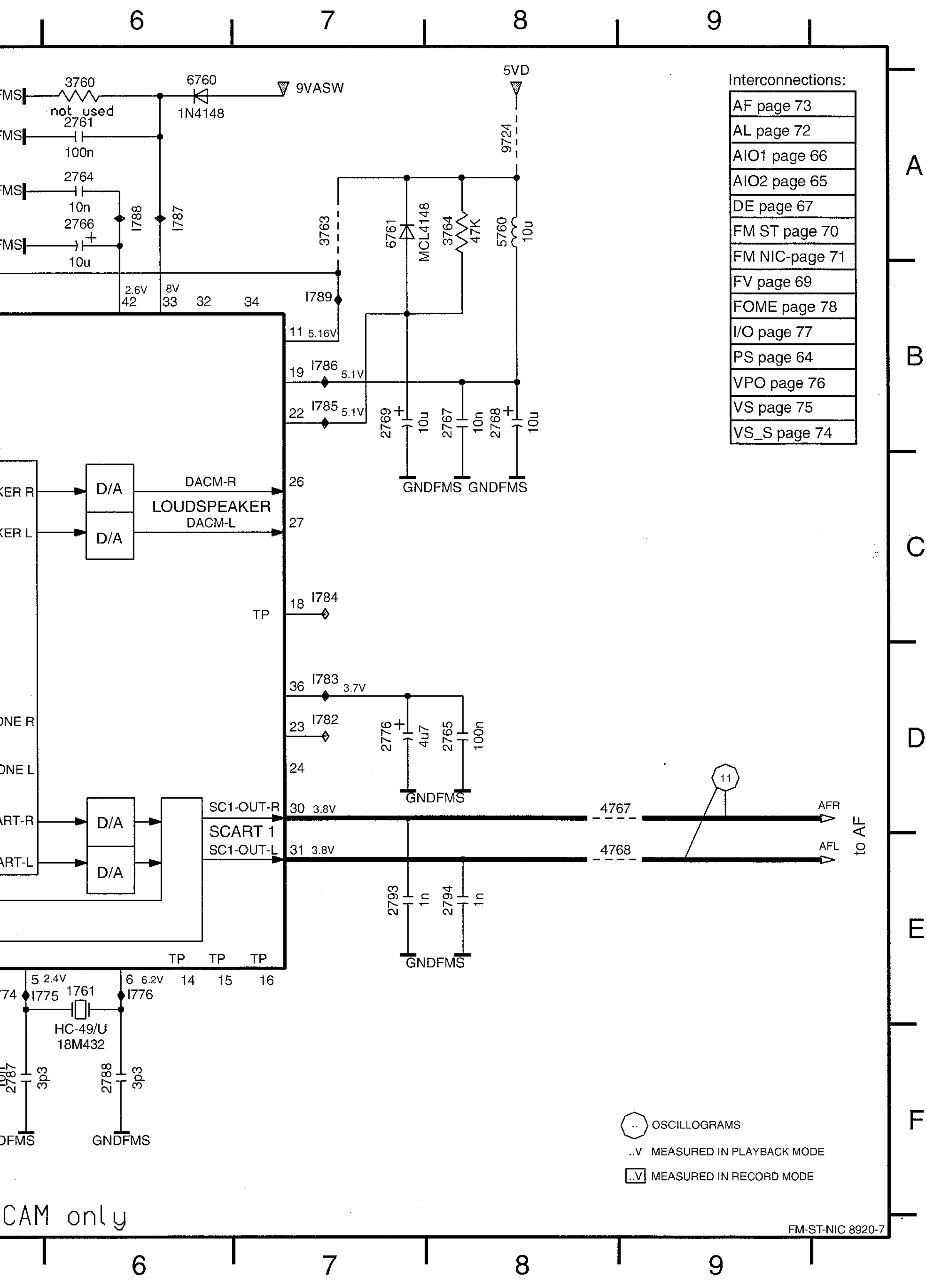

5
6
7
8
A
B
C
D
E
2775
10n
2789
10n
2.8V 33
2.7V 8
2.5V 3
2.5V 6
38
39
40
AF2I
AF1I
CDE1
CDE2
EXTM
EXTR
EXTL
STEREO DECODER
STEREO ADJUST
B/G, D/K, I, M(Korea)
STANDARD
AF SWITCH
OUTL 1 2.5V
OUTR 2 2.5V
OUTM 43
3775
470R
3776
470R
11
AFL
AFR
to AF
5VA
VREF 41 2.5V
2782
47u
AGND 7 0V
4760
VCC 28 5V
4769
5763
not used
I770
2786
470n
7760
TDA9873HZ
POWER SUPPLY
DIGITAL IDENTIFICATION PILOT NARROW-BAND PLL
IIC-BUS TRANSCEIVER
DGND 27
21
MAD 1.5V
4761
LPF
CID
CTRIG
SDA
SCL
P1
P2
31 3V
35 2.7V
34 2.5V
30 2.5V
29 2.5V
37
42
2783
100n 2780
4n7 2779
470n
100R 3766
100R 3769
3771
7K5
SDA from AI01
SCL from AI01
C760
9602
GNDFMS
GNDFV
9703
GNDFMS
GNDFV
TAL
TION
ATOR
CK
6V
AT-49
4M
reo only
Interconnections:
AF page 73
AL page 72
AIO1 page 66
AIO2 page 65
DE page 67
FM ST page 70
FM NIC-page 71
FV page 69
FOME page 78
I/O page 77
PS page 64
VPO page 76
VS page 75
VS_S page 74
.. OSCILLOGRAMS
..V MEASURED IN PLAYBACK MODE
..V MEASURED IN RECORD MODE
FM-ST-8920-8

1760	E5
2760	E3
2763	E3
2770	D4
2772	A3
2773	A3
2775	A5
2778	A5
2779	E6
2780	E5
2781	A5
2782	C7
2783	E5
2784	C2
2785	D4
2786	D8
2789	A6
3762	E3
3766	E6
3768	A3
3769	E6
3770	C2
3771	E5
3775	B7
3776	B8
4760	C7
4761	D7
4769	C8
5763	C8
7760	C5
9602	E2
9703	E3
C760	E2
I770	C8
I791	E3
I792	E3
I793	A3

7.8 FM Stereo + Nicam (FM-ST-NIC)


from PS
5VA
5VD
9VASW
SCL
from AI01
SDA
3765
100R
3767
100R
I760
I761
12
13
GNDFMS
2771
47p
I762
1.5V 3
8
SIF2
from FV
2792
47p
I763
1.5V 2
ANA_IN1+
7
AFV
from FV
2774
not used
I764
3.8V43
2777
not used
7761
MSP3415D
DEMODULATOR
FM1
FM2
NICAM A
NICAM B
S1...4
I2SL/R
I2SL/R
LOUDSPEAK
LOUDSPEAK
IDENT
IDENT
DFP
MONO
MONO-IN
A/D
A/D
SCART-L
SCART-R
HEADPHO
HEADPHO
41
SC1-IN-R
3.8V
SCART 1
I766
3V40
SC1-IN-L
38
SC2-IN-R
37
SC2-IN-L
SCART 2
SCART Switching Facilities
GNDFMS
4759
5.2V
10
7
8
9
I790
4
ADR.-SEL
TP
TP
TP
TP
NC NC NC NC
25 29 35 39 44 17 21 28 20
F760
4762
I768
4763
4764
I772
4765
F761
5762
10u
5761
100u
2790
10u
2791
5.1V
5VA
for German stereo + NI
F
G
9
10

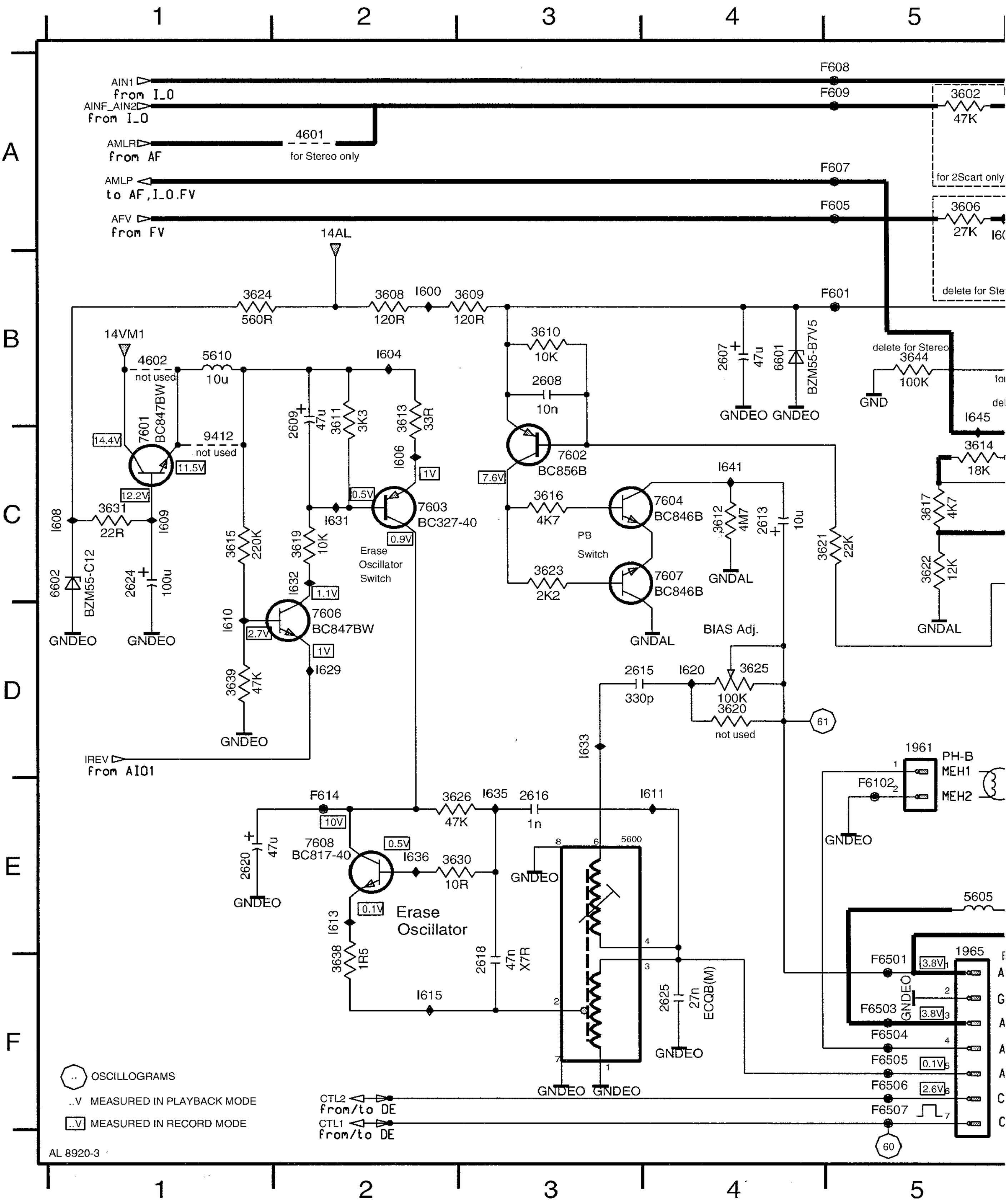
attention for pos. 7761 solder direction!

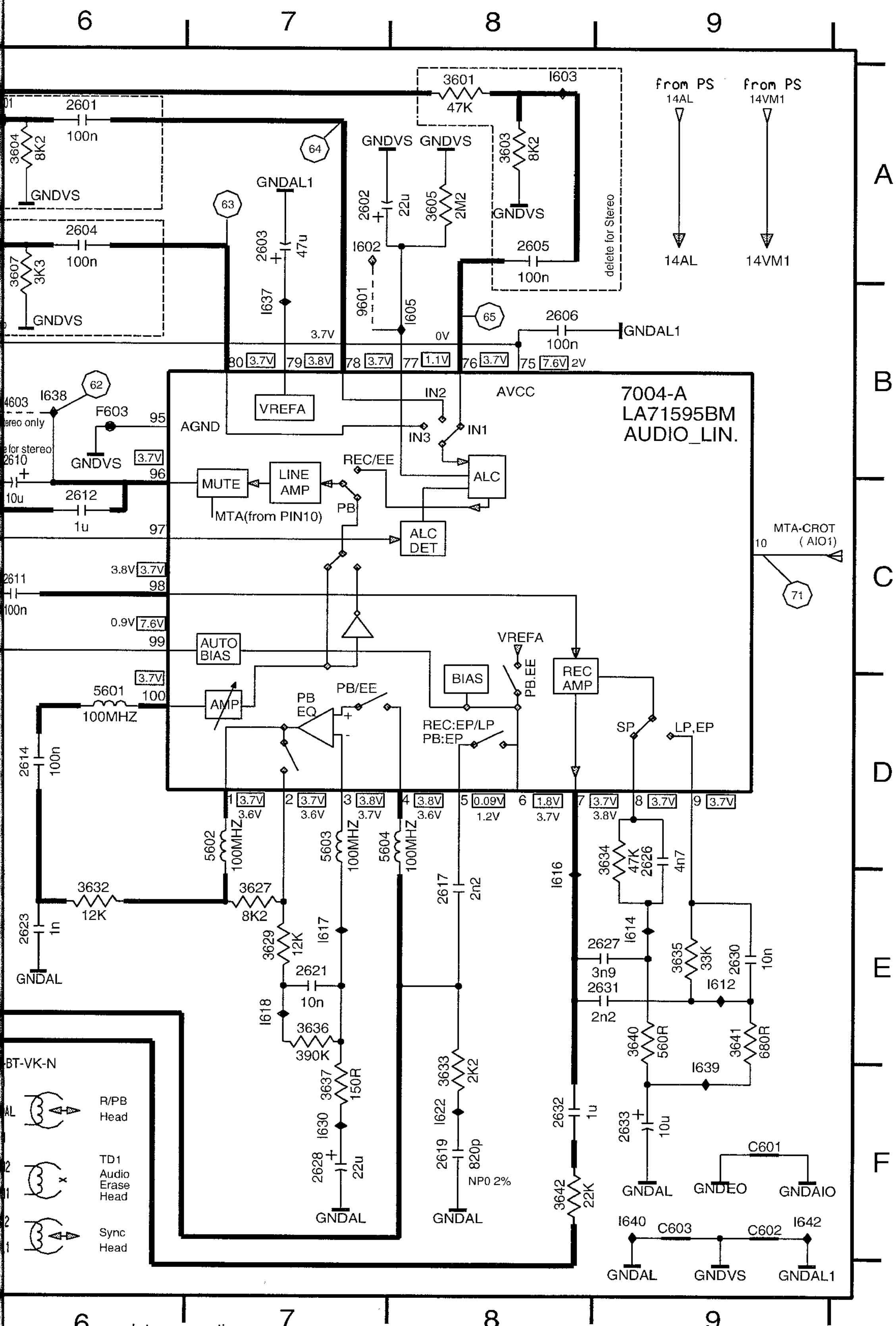


6
7
8
9
A
B
C
D
E
F
3760
not used
6760
1N4148
9VASW
5VD
2761
100n
2764
10n
2766
10u
I788
I787
9724
3763
6761
MCL4148
3764
47K
5760
10u
2.6V
42
8V
33
32
34
I789
11 5.16V
19
I786
5.1V
22
I785
5.1V
2769
10u
2767
10n
2768
10u
GNDFMS
GNDFMS
D/A
DACM-R
26
LOUDSPEAKER
DACM-L
27
D/A
TP
18
I784
36
I783
3.7V
23
I782
24
2776
4u7
2765
100n
GNDFMS
11
SC1-OUT-R
30 3.8V
4767
AFR
SCART 1
SC1-OUT-L
31 3.8V
4768
AFL
to AF
D/A
D/A
2793
1n
2794
1n
GNDFMS
TP
TP
TP
14
15
16
5 2.4V
I775
1761
6 6.2V
I776
HC-49/U
18M432
2787
3p3
2788
3p3
GNDFMS
Interconnections:
AF page 73
AL page 72
AIO1 page 66
AIO2 page 65
DE page 67
FM ST page 70
FM NIC-page 71
FV page 69
FOME page 78
I/O page 77
PS page 64
VPO page 76
VS page 75
VS_S page 74
OSCILLOGRAMS
..V MEASURED IN PLAYBACK MODE
..V MEASURED IN RECORD MODE
CAM only
FM-ST-NIC 8920-7

1761	E6
2761	A6
2764	A6
2765	D8
2766	A6
2767	B8
2768	B8
2769	B7
2771	C2
2774	D2
2776	D7
2777	D2
2787	F5
2788	F6
2790	F5
2791	F5
2792	C2
2793	E7
2794	E8
3760	A6
3763	A7
3764	A8
3765	B2
3767	B2
4759	A5
4762	F3
4763	F3
4764	F3
4765	F4
4767	D8
4768	E8
5760	A8
5761	F5
5762	E5
6760	A6
6761	A7
7761	B3
9724	A8
F760	E3
F761	E5
I760	B2
I761	B2
I762	B2
I763	C2
I764	C2
I766	D2
I768	E3
I772	E4
I774	E5
I775	E6
I776	E6
I782	D7
I783	D7
I784	C7
I785	B7
I786	B7
I787	A6
I788	A6
I789	B7
I790	B5

7.9 Audio Linear (AL)


1
2
3
4
5
A
B
C
D
E
F
AIN1
from I_O
AINF_AIN2
from I_O
AMLR
from AF
4601
for Stereo only
AMLP
to AF,I_O.FV
AFV
from FV
F608
F609
F607
F605
3602
47K
for 2Scart only
3606
27K
delete for Ste
14AL
3624
560R
3608
120R
I600
3609
120R
F601
14VM1
4602
not used
5610
10u
I604
3610
10K
2608
10n
2607
47u
6601
BZM55-B7V5
GNDEO
GNDEO
delete for Stereo
3644
100K
GND
I645
3614
18K
7601
BC847BW
14.4V
11.5V
12.2V
9412
not used
2609
47u
3611
3K3
3613
33R
I606
1V
7602
BC856B
7.6V
0.5V
7603
BC327-40
0.9V
I631
3616
4K7
7604
BC846B
I641
3612
4M7
2613
10u
3621
22K
3617
4K7
3622
12K
GNDAL
I608
3631
22R
I609
6602
BZM55-C12
2624
100u
GNDEO
GNDEO
3615
220K
3619
10K
Erase
Oscillator
Switch
PB
Switch
3623
2K2
7607
BC846B
GNDAL
GNDAL
I632
1.1V
7606
BC847BW
I610
2.7V
1V
I629
3639
47K
GNDEO
BIAS Adj.
2615
330p
I620
3625
100K
3620
not used
61
I633
IREV
from AI01
1961
PH-B
MEH1
MEH2
F6102
GNDEO
F614
10V
3626
47K
I635
2616
1n
I611
2620
47u
GNDEO
7608
BC817-40
0.5V
I636
3630
10R
0.1V
Erase
Oscillator
GNDEO
5600
I613
3638
1R5
2618
47n
X7R
I615
2625
27n
ECQB(M)
GNDEO
GNDEO
GNDEO
5605
1965
F6501
3.8V
F6503
3.8V
GNDEO
F6504
F6505
0.1V
F6506
2.6V
F6507
CTL2
from/to DE
CTL1
from/to DE
60
OSCILLOGRAMS
..V MEASURED IN PLAYBACK MODE
..V MEASURED IN RECORD MODE
AL 8920-3

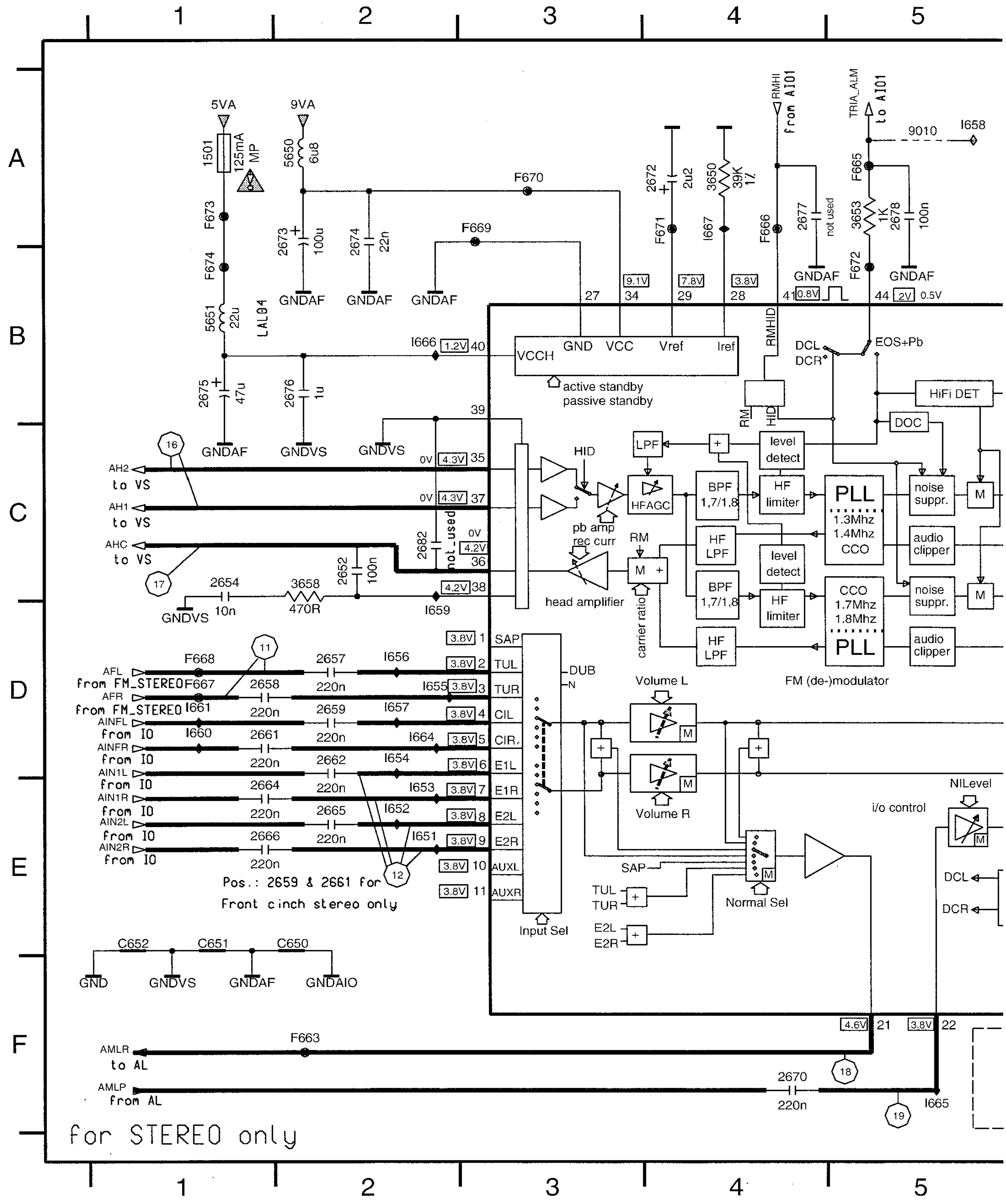

6
7
8
9
A
B
C
D
E
F
2601
100n
3604
8K2
GNDVS
2604
100n
3607
3K3
GNDVS
3601
47K
I603
GNDVS
GNDVS
3603
8K2
GNDVS
2602
22u
3605
2M2
I602
9601
I605
2605
100n
delete for Stereo
64
63
GNDAL1
2603
47u
I637
3.7V
0V
65
2606
100n
GNDAL1
from PS
14AL
from PS
14VM1
14AL
14VM1
80
3.7V
79
3.8V
78
3.7V
77
1.1V
76
3.7V
75
7.6V
2V
7004-A
LA71595BM
AUDIO_LIN.
VREFA
AGND
IN2
AVCC
IN3
IN1
ALC
REC/EE
MUTE
LINE AMP
PB
MTA(from PIN10)
ALC DET
4603
I638
62
F603
95
stereo only
for stereo
2610
GNDVS
3.7V
96
10u
2612
1u
97
MTA-CROT
(AIO1)
10
71
2611
100n
3.8V
3.7V
98
0.9V
7.6V
99
AUTO BIAS
VREFA
BIAS
REC AMP
PB.EE
3.7V
5601
100MHZ
100
AMP
PB EQ
PB/EE
REC:EP/LP
PB:EP
SP
LP,EP
2614
100n
1
3.7V
3.6V
2
3.7V
3.6V
3
3.8V
3.7V
4
3.8V
3.6V
5
0.09V
1.2V
6
1.8V
3.7V
7
3.7V
3.8V
8
3.7V
9
3.7V
5602
100MHZ
5603
100MHZ
5604
100MHZ
2617
2n2
I616
3634
47K
2626
4n7
3632
12K
3627
8K2
2623
1n
GNDAL
3629
12K
I617
2621
10n
I618
3636
390K
3637
150R
I630
2628
22u
GNDAL
3633
2K2
I622
2619
820p
NP0 2%
GNDAL
2627
3n9
I614
2631
2n2
3635
33K
2630
10n
I612
3640
560R
3641
680R
I639
2632
1u
2633
10u
3642
22K
GNDAL
C601
GNDEO
GNDAIO
I640
C603
C602
I642
GNDAL
GNDVS
GNDAL1
BT-VK-N
R/PB Head
TD1 Audio Erase Head
Sync Head

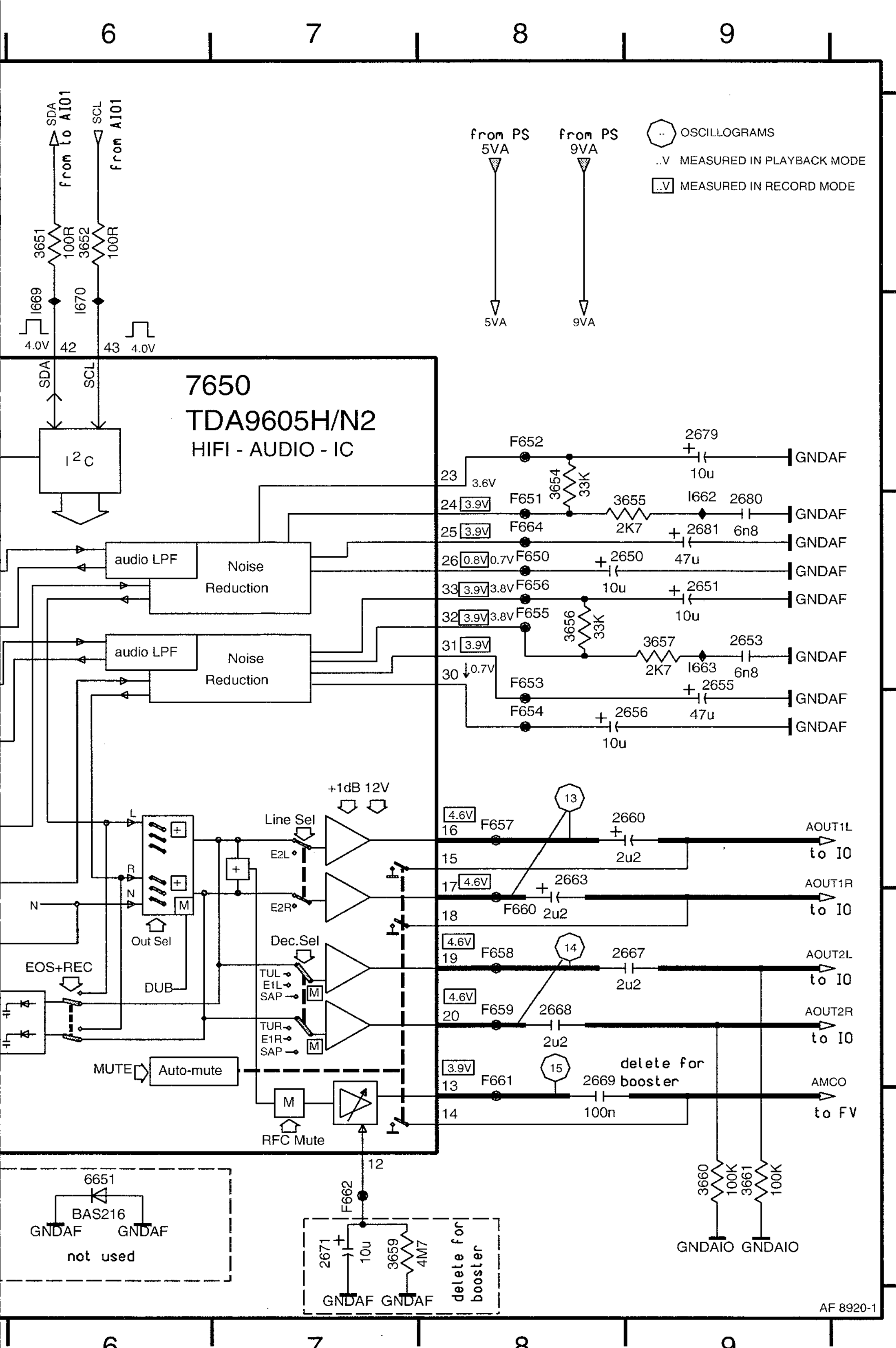
0010	E1
0200	F2
1961	D5
1965	F5
2601	A6
2602	A7
2603	A7
2604	A6
2605	A8
2606	B8
2607	B4
2608	B3
2609	B2
2610	B6
2611	C6
2612	C6
2613	C4
2614	D6
2615	D3
2616	E3
2617	E8
2618	F3
2619	F8
2620	E1
2621	E7
2623	E6
2624	C1
2625	F4
2626	D9
2627	E9
2628	F7
2630	E9
2631	E9
2632	F8
2633	F9
3601	A8
3602	A5
3603	A8
3604	A6
3605	A8
3606	A5
3607	A6
3608	B2
3609	B3
3610	B3
3611	B2
3612	C4
3613	B2
3614	C5
3615	C1
3616	C3
3617	C5
3619	C2
3620	D4
3621	C5
3622	C5
3623	C3
3624	B1
3625	D4
3626	E2
3627	E7
3629	E7
3630	E2
3631	C1
3632	E6
3633	F8
3634	D9
3635	E9
3636	E7
3637	F7
3638	F2
3639	D1
3640	E9
3641	E9
3642	F8
3644	B5
4601	A2
4602	B1
4603	B6
5600	E3
5601	D6
5602	D7
5603	D7
5604	D8
5605	E5
5610	B1
6601	B4
6602	C1
7004-A	B9
7601	C1
7602	C3
7603	C2
7604	C4
7606	D2
7607	C4
7608	E2
9412	C1
9601	B7
C601	F9
C602	F9
C603	F9
F601	B5
F603	B6
F605	A5
F607	A5
F608	A5
F609	A5
F6102	E5
F614	E2
F6501	F5
F6503	F5
F6504	F5
F6505	F5
F6506	F5
F6507	F5
I600	B2
I601	A6
I602	A7
I603	A8
I604	B2
I605	B8
I606	C2
I607	A5
I608	C1
I609	C1
I610	D1
I611	E4
I612	E9
I613	E2
I614	E9
I615	F2
I616	E8
I617	E7
I618	E7
I620	D4
I622	F8
I629	D2
I630	F7
I631	C2
I632	C2
I633	D3
I635	E3
I636	E2
I637	B7
I638	B6
I639	F9
I640	F9
I641	C4
I642	F9
I645	B5

Interconnections:

AF page 73	AL page 72	AIO1 page 66	AIO2 page 65	DE page 67	FM ST page 70	FM NIC-page 71
FV page 69	FOME page 78	I/O page 77	PS page 64	VPO page 76	VS page 75	VS_S page 74

7.10 FM - Audio (AF)


1
2
3
4
5
A
B
C
D
E
F
5VA
9VA
1501
125mA
MP
5650
6u8
F670
F669
F673
F674
2673
100u
2674
22n
GNDAF
GNDAF
GNDAF
2672
2u2
3650
39K
1%
F671
I667
RMHI
from AI01
F666
2677
not used
GNDAF
TRIA_ALM
to AI01
9010
I658
F665
3653
1K
2678
100n
F672
GNDAF
9.1V
7.8V
3.8V
27
34
29
28
41
0.8V
44
2V
0.5V
5651
22u
LAL04
I666
1.2V
40
VCCH
GND
VCC
Vref
Iref
RMHID
DCL
DCR
EOS+Pb
active standby
passive standby
2675
47u
2676
1u
GNDAF
GNDVS
GNDVS
39
RM
HID
HiFi DET
DOC
LPF
level detect
16
AH2
to VS
0V
4.3V
35
HID
AH1
to VS
0V
4.3V
37
HFAGC
BPF 1,7/1,8
HF limiter
PLL
1.3Mhz
1.4Mhz
CCO
noise suppr.
M
AHC
to VS
2682
not_used
0V
4.2V
36
pb amp
rec curr
RM
HF LPF
audio clipper
level detect
17
2652
100n
2654
10n
3658
470R
GNDVS
4.2V
38
I659
head amplifier
carrier ratio
M +
BPF 1,7/1,8
HF limiter
CCO
1.7Mhz
1.8Mhz
noise suppr.
M
HF LPF
PLL
audio clipper
FM (de-)modulator
3.8V 1 SAP
11
F668
2657
I656
3.8V 2 TUL
DUB
N
AFL
from FM_STEREO
F667
2658
220n
I655
3.8V 3 TUR
Volume L
AFR
from FM_STEREO
I661
220n
2659
I657
3.8V 4 CIL
AINFL
from IO
I660
2661
220n
I664
3.8V 5 CIR
AINFR
from IO
220n
2662
I654
3.8V 6 E1L
AIN1L
from IO
2664
220n
I653
3.8V 7 E1R
AIN1R
from IO
220n
2665
I652
3.8V 8 E2L
Volume R
NILevel
i/o control
AIN2L
from IO
2666
220n
I651
3.8V 9 E2R
AIN2R
from IO
220n
12
3.8V 10 AUXL
3.8V 11 AUXR
SAP
Pos.: 2659 & 2661 for
Front cinch stereo only
TUL
TUR
Normal Sel
DCL
DCR
E2L
E2R
Input Sel
C652
C651
C650
GND
GNDVS
GNDAF
GNDAIO
4.6V 21
3.8V 22
F663
AMLR
to AL
18
AMLP
from AL
2670
220n
19
I665
for STEREO only



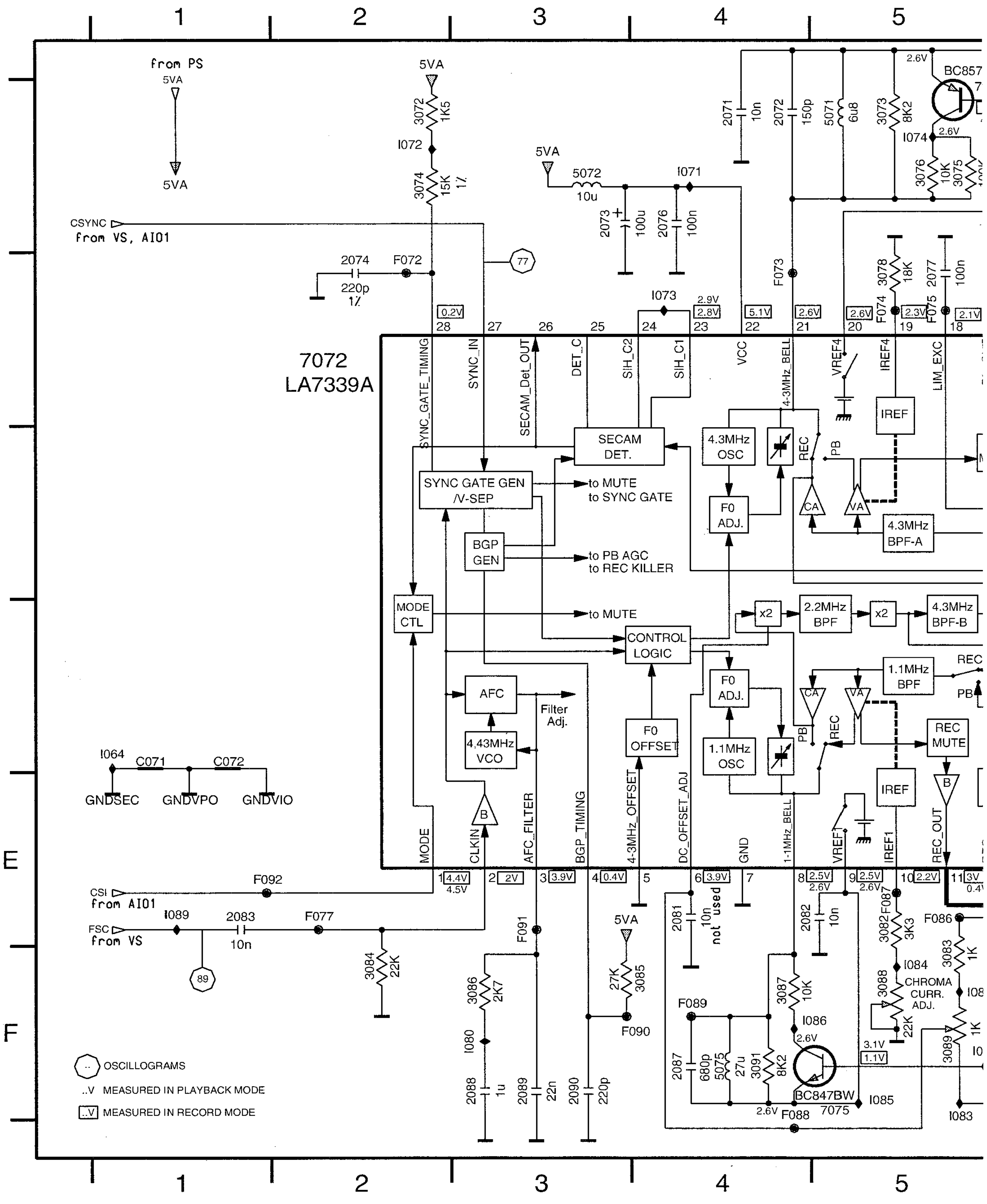
6
7
8
9
A
B
C
D
E
F
SDA
from to AI01
SCL
from AI01
3651
100R
3652
100R
I669
I670
4.0V
42
43
4.0V
from PS
5VA
from PS
9VA
5VA
9VA
OSCILLOGRAMS
..V MEASURED IN PLAYBACK MODE
..V MEASURED IN RECORD MODE
7650
TDA9605H/N2
HIFI - AUDIO - IC
I²C
SDA
SCL
audio LPF
Noise Reduction
audio LPF
Noise Reduction
F652
2679
10u
GNDAF
23
3.6V
3654
33K
24 3.9V
F651
3655
2K7
I662
2680
6n8
GNDAF
25 3.9V
F664
2681
47u
GNDAF
26 0.8V 0.7V
F650
2650
10u
GNDAF
33 3.9V 3.8V
F656
2651
10u
GNDAF
32 3.9V 3.8V
F655
3656
33K
31 3.9V
3657
2K7
I663
2653
6n8
GNDAF
30 0.7V
F653
2655
47u
GNDAF
F654
2656
10u
GNDAF
+1dB 12V
Line Sel
E2L
E2R
L
R
N
N
Out Sel
13
4.6V
16
F657
2660
2u2
AOUT1L
to IO
15
17 4.6V
F660
2663
2u2
AOUT1R
to IO
18
Dec.Sel
EOS+REC
DUB
TUL
E1L
SAP
TUR
E1R
SAP
M
14
4.6V
19
F658
2667
2u2
AOUT2L
to IO
4.6V
20
F659
2668
2u2
AOUT2R
to IO
MUTE
Auto-mute
15
3.9V
13
F661
2669
100n
delete for booster
AMCO
to FV
14
M
RFC Mute
12
F662
3660
100K
3661
100K
GNDAIO
GNDAIO
6651
BAS216
GNDAF
GNDAF
not used
2671
10u
3659
4M7
GNDAF
GNDAF
delete for booster
AF 8920-1

1501	A1
2650	C9
2651	C9
2652	C2
2653	C9
2654	C1
2655	D9
2656	D9
2657	D2
2658	D1
2659	D2
2660	D9
2661	D1
2662	D2
2663	D8
2664	E1
2665	E2
2666	E1
2667	E9
2668	E8
2669	E8
2670	F4
2671	F7
2672	A4
2673	A2
2674	A2
2675	B1
2676	B2
2677	A4
2678	A5
2679	B9
2680	C9
2681	C9
2682	C2
3650	A4
3651	A6
3652	A6
3653	A5
3654	B8
3655	C9
3656	C8
3657	C9
3658	C2
3659	F7
3660	F9
3661	F9
5650	A2
5651	B1
6651	F6
7650	B3
9010	A5
C650	E2
C651	E1
C652	E1
F650	C8
F651	C8
F652	B8
F653	C8
F654	D8
F655	C8
F656	C8
F657	D8
F658	E8
F659	E8
F660	D8
F661	E8
F662	F7
F663	F2
F664	C8
F665	A5
F666	A4
F667	D1
F668	D1
F669	A3
F670	A3
F671	A4
F672	B5
F673	A1
F674	B1
I651	E2
I652	E2
I653	E2
I654	D2
I655	D2
I656	D2
I657	D2
I658	A5
I659	D2
I660	D1
I661	D1
I662	C9
I663	C9
I664	D2
I665	F5
I666	B2
I667	A4
I669	B6
I670	B6

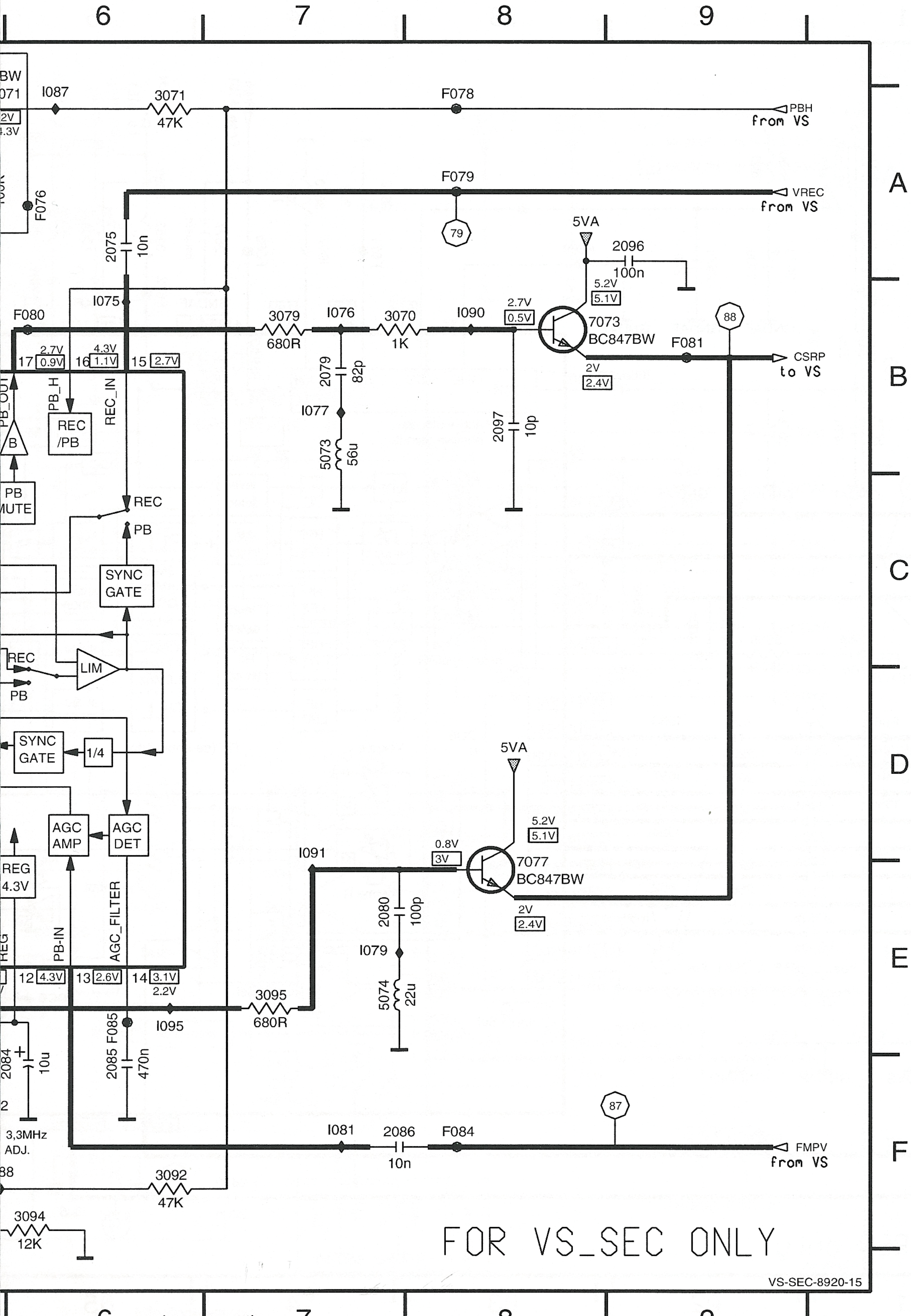
Interconnections:

AF page 73	AL page 72	AIO1 page 66	AIO2 page 65	DE page 67	FM ST page 70	FM NIC-page 71
FV page 69	FOME page 78	I/O page 77	PS page 64	VPO page 76	VS page 75	VS_S page 74

7.11 Video Signal Processing - SECAM (VS-SEC)



from PS
5VA
CSYNC
from VS, AI01
CSI
from AI01
FSC
from VS
7072
LA7339A
SYNC_GATE_TIMING
SYNC_IN
SECAM_Det_OUT
DET_C
SIH_C2
SIH_C1
VCC
4-3MHz_BELL
VREF4
IREF4
LIM_EXC
MODE
CLKIN
AFC_FILTER
BGP_TIMING
4-3MHz_OFFSET
DC_OFFSET_ADJ
GND
1-1MHz_BELL
VREF1
IREF1
REC_OUT
SECAM DET.
SYNC GATE GEN /V-SEP
to MUTE
to SYNC GATE
BGP GEN
to PB AGC
to REC KILLER
MODE CTL
CONTROL LOGIC
AFC
4,43MHz VCO
Filter Adj.
F0 OFFSET
4.3MHz OSC
F0 ADJ.
1.1MHz OSC
CA
VA
REC
PB
IREF
4.3MHz BPF-A
x2
2.2MHz BPF
4.3MHz BPF-B
1.1MHz BPF
REC MUTE
B
BC857
BC847BW
7075
CHROMA CURR. ADJ.
not used
I064 C071 C072
GNDSEC GNDVPO GNDVIO
OSCILLOGRAMS
..V MEASURED IN PLAYBACK MODE
..V MEASURED IN RECORD MODE

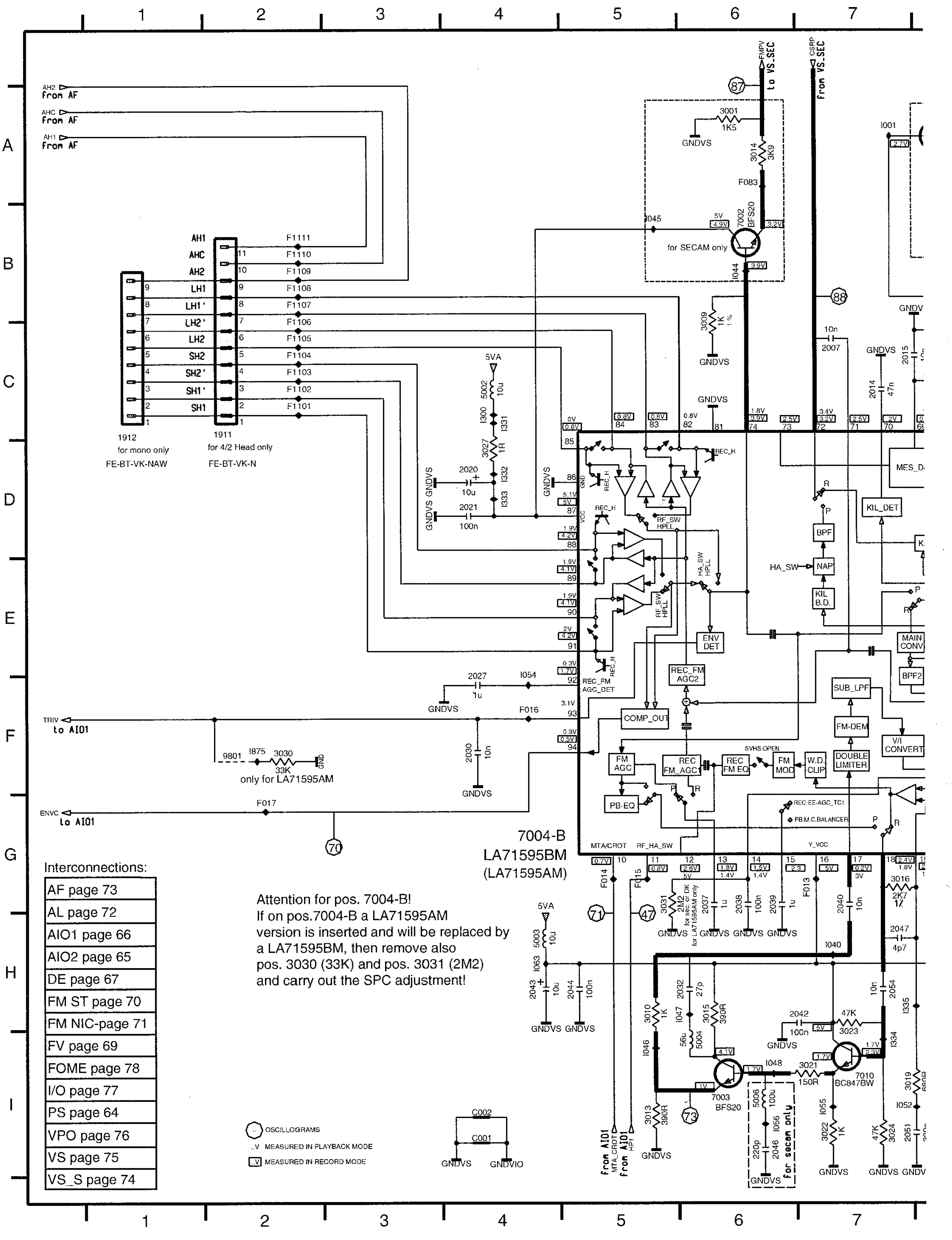

6
7
8
9
A
B
C
D
E
F
BW
071
2V
4.3V
I087
3071
47K
F078
PBH
from VS
F076
F079
VREC
from VS
79
2075
10n
5VA
2096
100n
5.2V
5.1V
I075
F080
3079
680R
I076
3070
1K
I090
2.7V
0.5V
7073
BC847BW
88
F081
CSRP
to VS
2V
2.4V
2.7V
0.9V
17
4.3V
1.1V
16
15
2.7V
PB_OUT
PB_H
REC_IN
REC
/PB
2079
82p
I077
5073
56u
2097
10p
B
PB
MUTE
REC
PB
SYNC
GATE
REC
PB
LIM
SYNC
GATE
1/4
5VA
AGC
AMP
AGC
DET
REG
4.3V
5.2V
5.1V
0.8V
3V
I091
7077
BC847BW
2V
2.4V
REG
PB-IN
AGC_FILTER
2080
100p
I079
5074
22u
12
4.3V
13
2.6V
14
3.1V
2.2V
3095
680R
I095
2084
10u
2085
F085
470n
2
3,3MHz
ADJ.
87
I081
2086
10n
F084
FMPV
from VS
88
3092
47K
3094
12K
FOR VS_SEC ONLY
VS-SEC-8920-15
6
8
9

2071 A4	I074 A5
2072 A4	I075 B6
2073 A3	I076 B7
2074 B2	I077 B7
2075 A6	I079 E7
2076 A4	I080 F3
2077 B5	I081 F7
2079 B7	I082 F5
2080 E7	I083 F5
2081 E4	I084 F5
2082 E4	I085 F5
2083 E1	I086 F5
2084 F6	I087 A6
2085 F6	I088 F5
2086 F7	I089 E1
2087 F4	I090 B8
2088 F3	I091 D7
2089 F3	I095 E6
2090 F3	
2096 A9	
2097 B8	
3070 B7	
3071 A6	
3072 A2	
3073 A5	
3074 A2	
3075 A5	
3076 A5	
3078 B5	
3079 B7	
3082 E5	
3083 F5	
3084 F2	
3085 F4	
3086 F3	
3087 F4	
3088 F5	
3089 F5	
3091 F4	
3092 F6	
3094 F6	
3095 E7	
5071 A5	
5072 A3	
5073 B7	
5074 E7	
5075 F4	
7071 A6	
7072 B2	
7073 B8	
7075 F5	
7077 E8	
C071 D1	
C072 D1	
F072 B2	
F073 B4	
F074 B5	
F075 B5	
F076 A6	
F077 E2	
F078 A8	
F079 A8	
F080 B6	
F081 B9	
F084 F8	
F085 E6	
F086 E5	
F087 E5	
F088 F4	
F089 F4	
F090 F4	
F091 E3	
F092 E1	
I064 D1	
I071 A4	
I072 A2	
I073 B4	

Interconnections:

AF page 73	AL page 72	AIO1 page 66	AIO2 page 65	DE page 67	FM ST page 70	FM NIC-page 71
FV page 69	FOME page 78	I/O page 77	PS page 64	VPO page 76	VS page 75	VS_S page 74

7.12 Video Signal Processing (VS)

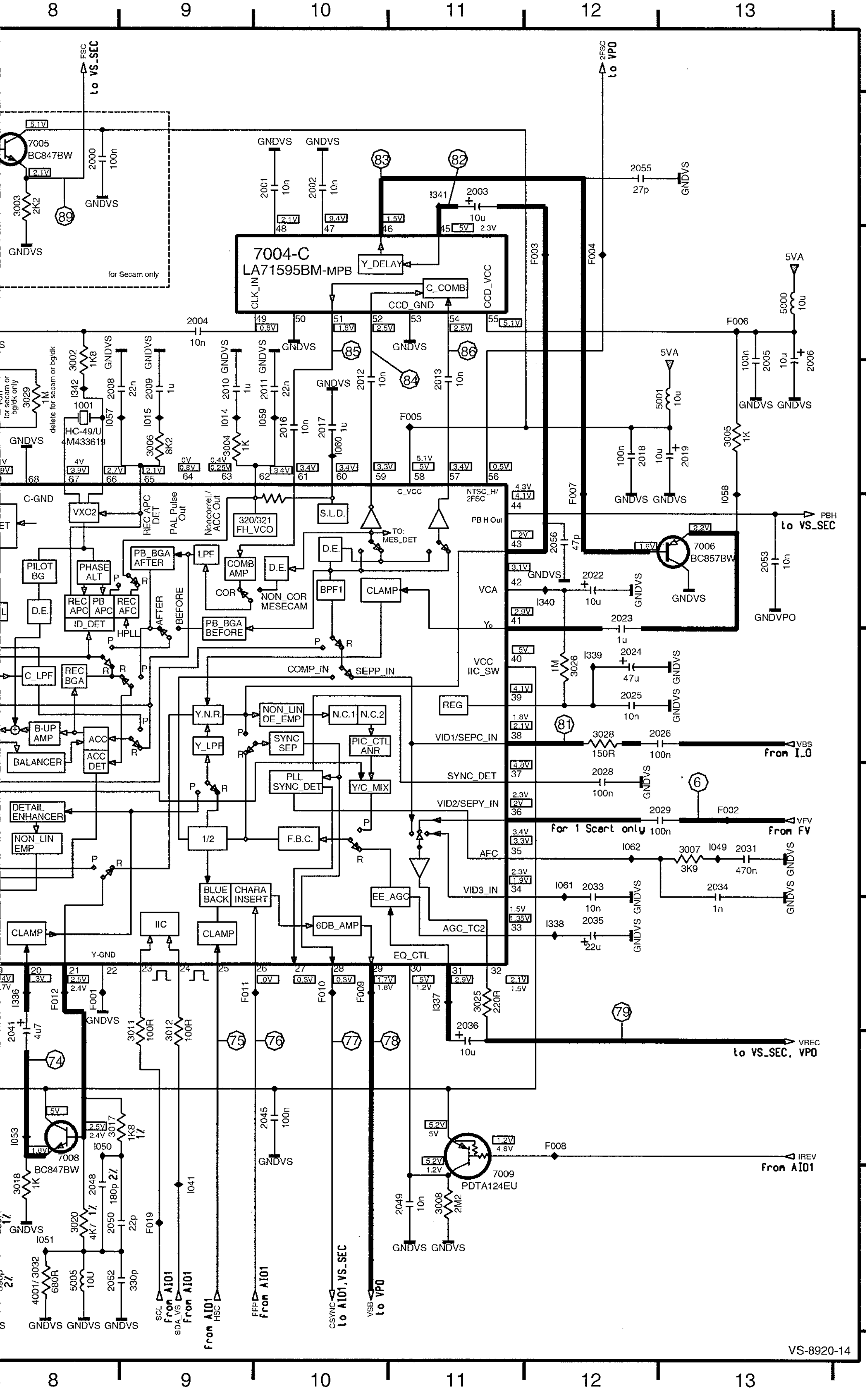


1
2
3
4
5
6
7
A
B
C
D
E
F
G
H
I
AH2 from AF
AHC from AF
AH1 from AF
AH1
AHC
AH2
LH1
LH1'
LH2'
LH2
SH2
SH2'
SH1'
SH1
F1111
F1110
F1109
F1108
F1107
F1106
F1105
F1104
F1103
F1102
F1101
1912
for mono only
FE-BT-VK-NAW
1911
for 4/2 Head only
FE-BT-VK-N
FMPV to VS_SEC
CSRP from VS_SEC
87
88
3001
1K5
GNDVS
3014
3K9
F083
I045
7002
BFS20
for SECAM only
I044
3009
1K
1%
2007
10n
2014
47n
2015
I001
5VA
5002
10u
I300
I331
3027
1R
I332
I333
2020
10u
2021
100n
GNDVS
REC_H
RF_SW HPLL
HA_SW HPLL
ENV DET
REC_FM AGC2
REC_FM AGC_DET
COMP_OUT
FM AGC
REC FM_AGC1
REC FM EQ
FM MOD
W.D. CLIP
DOUBLE LIMITER
FM-DEM
SUB_LPF
V/I CONVERT
BPF2
MAIN CONV
KIL_DET
MES_D
BPF
NAP
HA_SW
KIL B.D.
PB-EQ
SVHS:OPEN
REC:EE-AGC_TC1
PB:M.C.BALANCER
MTA/CROT
RF_HA_SW
Y_VCC
2027
1u
I054
TRIV to AIO1
F016
2030
10n
9801
I875
3030
33K
only for LA71595AM
ENVC to AIO1
F017
70
7004-B
LA71595BM
(LA71595AM)
F014
F015
71
47
3031
2M2
for sec. or DK
for LA71595AM only
2037
1u
2038
100n
2039
1u
F013
2040
10n
3016
2K7
1%
2047
4p7
I040
5VA
5003
10u
I063
2043
10u
2044
100n
3010
1K
2032
27p
I047
3015
390R
5004
56u
I046
7003
BFS20
73
3013
390R
I048
3021
150R
5006
100u
I056
2046
220p
for secam only
2042
100n
47K
3023
7010
BC847BW
2054
10n
I335
I334
3019
I052
2051
3022
1K
3024
47K
I055
C002
C001
GNDVIO
from AIO1 MTA_CROT
from AIO1 HP1
OSCILLOGRAMS
..V MEASURED IN PLAYBACK MODE
MEASURED IN RECORD MODE

Interconnections:

AF page 73
AL page 72
AIO1 page 66
AIO2 page 65
DE page 67
FM ST page 70
FM NIC-page 71
FV page 69
FOME page 78
I/O page 77
PS page 64
VPO page 76
VS page 75
VS_S page 74

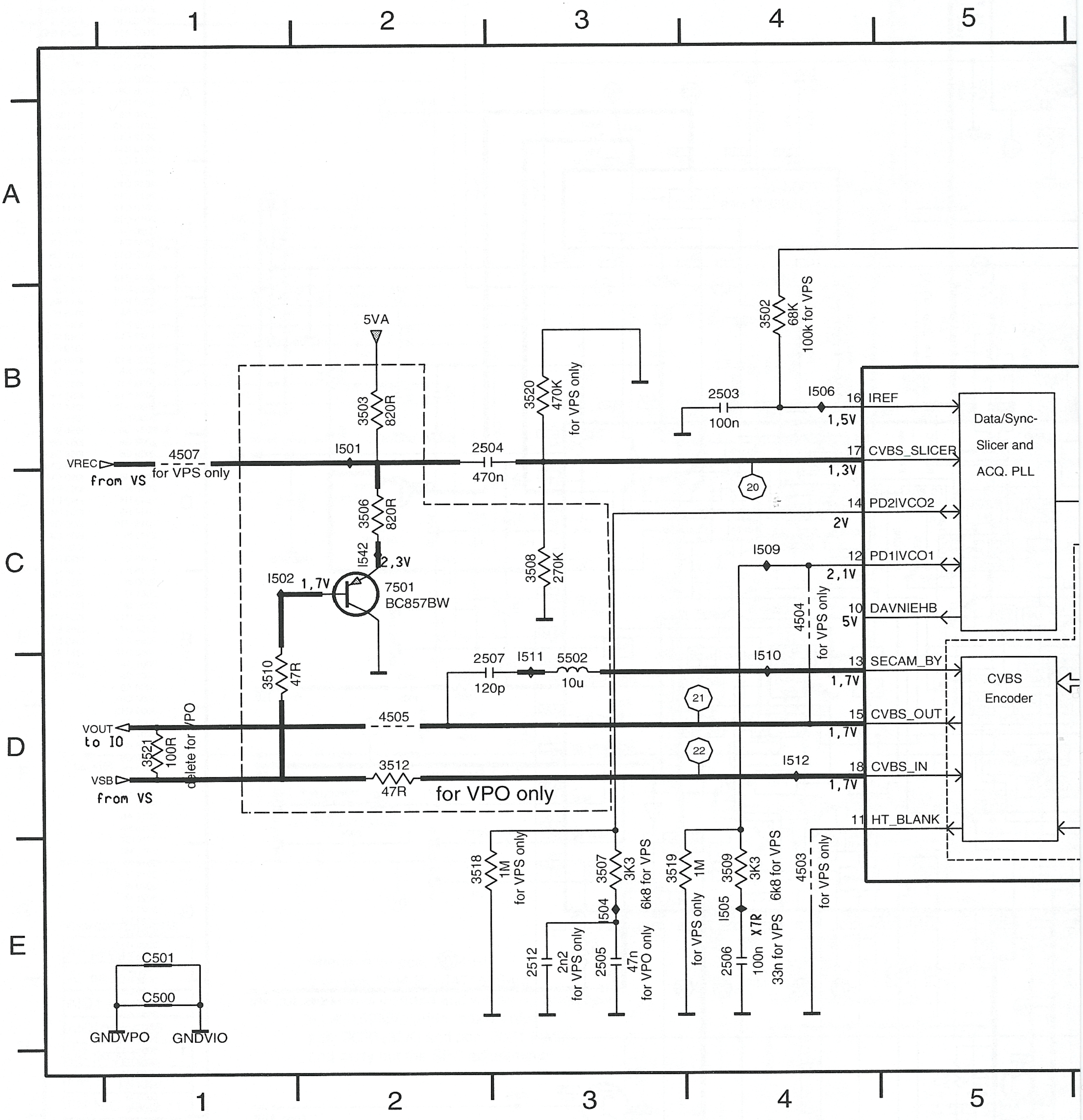
Attention for pos. 7004-B!
If on pos.7004-B a LA71595AM version is inserted and will be replaced by a LA71595BM, then remove also pos. 3030 (33K) and pos. 3031 (2M2) and carry out the SPC adjustment!


8
9
10
11
12
13
A
B
C
D
E
F
G
H
I
FSC
to VS_SEC
2FSC
to VPO
5.1V
7005
BC847BW
2.1V
2000
100n
GNDVS
3003
2K2
89
for Secam only
GNDVS
GNDVS
2001
10n
2002
10n
2.1V
9.4V
1.5V
83
82
I341
2003
10u
2.3V
5V
2055
27p
GNDVS
7004-C
LA71595BM-MPB
Y_DELAY
C_COMB
CLK_IN
CCD_GND
CCD_VCC
F003
F004
5VA
5000
10u
48
47
46
45
49
50
51
52
53
54
55
0.8V
1.8V
2.5V
2.5V
5.1V
2004
10n
F006
GNDVS
85
86
84
2012
10n
2013
10n
100n
2005
10u
2006
GNDVS
GNDVS
3002
1K8
I342
1001
HC-49/U
4M433619
2008
22n
2009
1u
I057
I015
3006
8K2
3029
1M
delete for secam or bg/dk only
2010
1u
2011
22n
I014
I059
3004
1K
2016
10n
2017
1u
I060
F005
5VA
5001
10u
100n
2018
10u
2019
3005
1K
GNDVS
GNDVS
4V
3.9V
2.7V
2.1V
0V
0.8V
0.4V
0.25V
3.4V
3.4V
3.4V
3.3V
5.1V
5V
3.4V
0.5V
68
67
66
65
64
63
62
61
60
59
58
57
56
C-GND
VXO2
REC APC DET
PAL Pulse Out
Noncorrel./ ACC Out
320/321 FH_VCO
S.L.D.
C_VCC
NTSC_H/ 2FSC
4.3V
4.1V
44
PB H Out
F007
I058
PBH
to VS_SEC
2.2V
1.6V
7006
BC857BW
GNDVS
2053
10n
GNDVPO
PILOT BG
PHASE ALT
PB_BGA AFTER
LPF
COMB AMP
D.E.
D.E.
TO: MES_DET
2V
43
2056
47p
D.E.
REC APC
PB APC
REC AFC
ID_DET
HPLL
AFTER
BEFORE
COR
NON_COR MESECAM
BPF1
CLAMP
VCA
3.1V
42
GNDVS
2022
10u
I340
2.9V
41
Y0
2023
1u
PB_BGA BEFORE
C_LPF
REC BGA
COMP_IN
SEPP_IN
VCC
IIC_SW
5V
40
1M
3026
I339
2024
47u
Y.N.R.
NON_LIN DE_EMP
N.C.1
N.C.2
REG
4.1V
39
2025
10n
B-UP AMP
ACC
ACC DET
BALANCER
Y_LPF
SYNC SEP
PIC_CTL ANR
VID1/SEPC_IN
1.8V
2.1V
38
81
3028
150R
2026
100n
VBS
from I_O
PLL SYNC_DET
Y/C_MIX
SYNC_DET
4.8V
37
2028
100n
6
DETAIL ENHANCER
VID2/SEPY_IN
2.3V
2V
36
2029
100n
F002
VFV
for 1 Scart only
from FV
NON_LIN EMP
1/2
F.B.C.
AFC
3.4V
3.3V
35
I062
3007
3K9
I049
2031
470n
BLUE BACK
CHARA INSERT
EE_AGC
VID3_IN
2.3V
1.9V
34
I061
2033
10n
2034
1n
CLAMP
IIC
CLAMP
6DB_AMP
AGC_TC2
1.5V
1.35V
33
I338
2035
22u
Y-GND
EQ_CTL
20
21
22
23
24
25
26
27
28
29
30
31
32
3V
2.5V
2.4V
0V
0.3V
0.3V
1.7V
1.8V
5V
1.2V
2.9V
2.1V
1.5V
I336
F012
F001
GNDVS
F011
F010
F009
I337
3025
220R
79
2041
4u7
3011
100R
3012
100R
75
76
77
78
2036
10u
VREC
to VS_SEC, VPO
74
5V
7008
BC847BW
1.8V
2.5V
2.4V
3017
1K8
I050
I053
2045
100n
GNDVS
5.2V
5V
7009
PDTA124EU
1.2V
4.8V
F008
IREV
from AI01
5.2V
1.2V
3018
1K
2048
180p
I041
2049
10n
3008
2M2
GNDVS
3020
4K7
2050
22p
F019
GNDVS
GNDVS
I051
4001/3032
680R
5005
10U
2052
330p
GNDVS
GNDVS
GNDVS
SCL
from AI01
SDA_VS
from AI01
from AI01
HSC
FFP
from AI01
CSYNC
to AI01,VS_SEC
VSB
to VPO
VS-8920-14

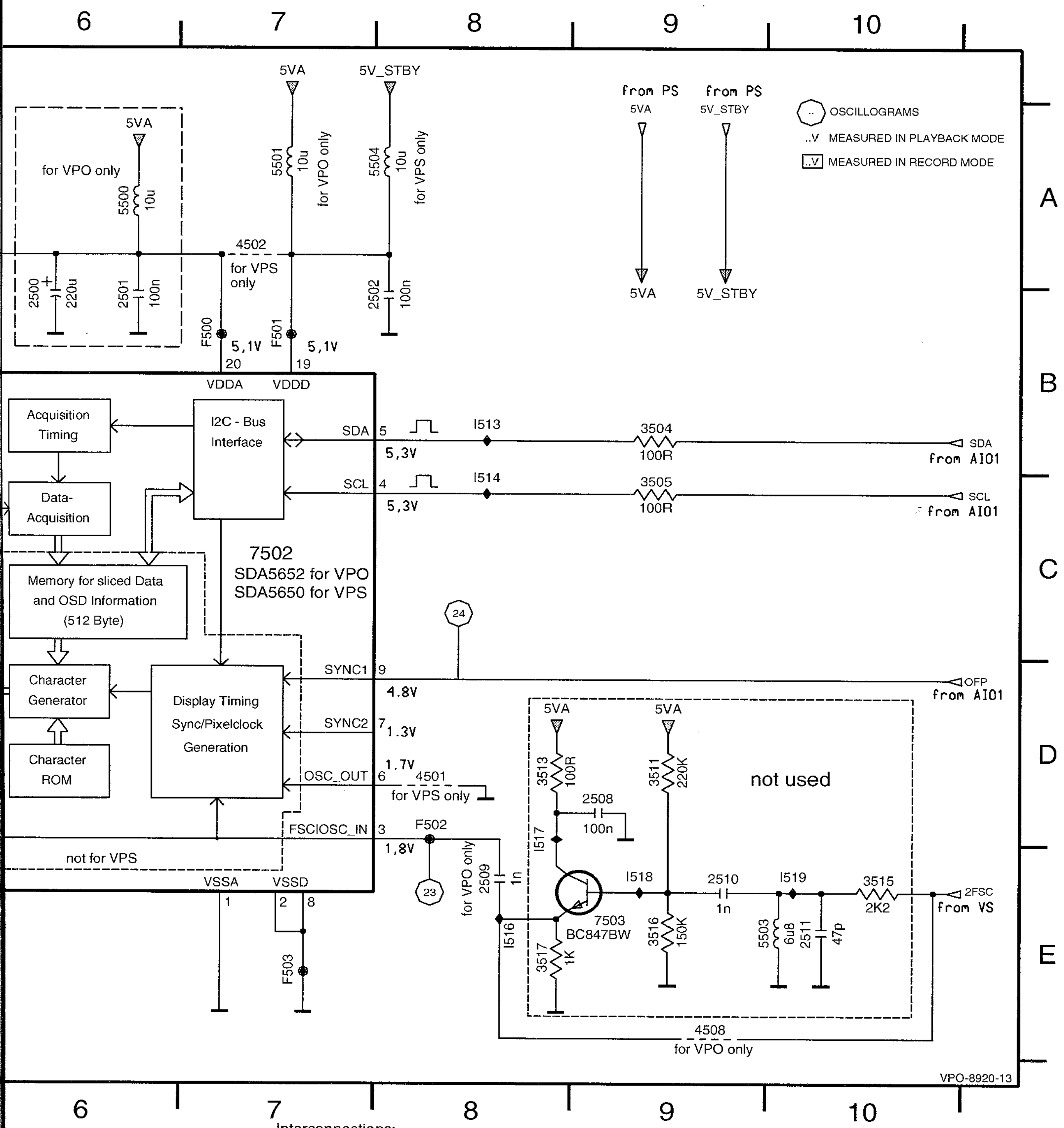
Part	Location
0050	D1
0051	E1
1001	C8
1911	B2
1912	B1
2000	A8
2001	A10
2002	A10
2003	A11
2004	B9
2005	C13
2006	C13
2007	C7
2008	C8
2009	C9
2010	C9
2011	C10
2012	C10
2013	C11
2014	C7
2015	C7
2016	C10
2017	C10
2018	C12
2019	C13
2020	D4
2021	D4
2022	D12
2023	D12
2024	E12
2025	E12
2026	E13
2027	F4
2028	F12
2029	F13
2030	F4
2031	F13
2032	H6
2033	F12
2034	F13
2035	G12
2036	G11
2037	G6
2038	G6
2039	G6
2040	G7
2041	H8
2042	H7
2043	H4
2044	H5
2045	H10
2046	I6
2047	H7
2048	I8
2049	I11
2050	I8
2051	I7
2052	I8
2053	D13
2054	H7
2055	A12
2056	D12
3001	A6
3002	C8
3003	A8
3004	C9
3005	C13
3006	C9
3007	F13
3008	I11
3009	C6
3010	H5
3011	H9
3012	H9
3013	I5
3014	A6
3015	H6
3016	G7
3017	H8
3018	I8
3019	I7
3020	I8
3021	I7
3022	I7
3023	H7
3024	I7
3025	G11
3026	E12
3027	D4
3028	E12
3029	C8
3030	F2
3031	G5
4001/3032	I8
5000	B13
5001	C13
5002	C4
5003	H4
5004	I6
5005	I8
5006	I6
7002	B6
7003	I6
7004-B	G4
7004-C	B9
7005	A8
7006	D13
7008	H8
7009	I11
7010	I7
9801	F2
C001	I2
C002	I2
F001	G8
F002	F13
F003	B12
F004	B12
F005	C11
F006	B13
F007	D12
F008	H12
F009	G10
F010	G10
F011	G9
F012	G8
F013	G7
F014	G5
F015	G5
F016	F4
F017	G2
F019	I9
F083	A6
F1101	C2
F1102	C2
F1103	C2
F1104	C2
F1105	C2
F1106	C2
F1107	B2
F1108	B2
F1109	B2
F1110	B2
F1111	B2
I001	A7
I014	C9
I015	C9
I040	H7
I041	I9
I044	B6
I045	B5
I046	I5
I047	H5
I048	I6
I049	F13
I050	H8
I051	I8
I052	I7
I053	H8
I054	E4
I055	I7
I056	I6
I057	C8
I058	D13
I059	C10
I060	C10
I061	F12
I062	F12
I063	H4
I300	C4
I331	C4
I332	D4
I333	D4
I334	I7
I335	H7
I336	G8
I337	G11
I338	G12
I339	E12
I340	D12
I341	A11
I342	C8
I875	F2

7.13 VPS/PDC & OSD Part (VPO)

2500 B6	2503 B4	2506 E4	2509 E8	2512 E3	3504 B9	3507 E3	3510 D1	3513 D8	3517 E8	3520 B3	4502 A7	4505
2501 B6	2504 B2	2507 D2	2510 E9	3502 B4	3505 C9	3508 C3	3511 D9	3515 E10	3518 E2	3521 D1	4503 E4	4507
2502 B8	2505 E3	2508 D9	2511 E10	3503 B2	3506 C2	3509 E4	3512 D2	3516 E9	3519 E3	4501 D8	4504 C4	4508


1
2
3
4
5
A
B
C
D
E
5VA
3503
820R
3506
820R
I542
2,3V
7501
BC857BW
I502
1,7V
3510
47R
VREC
from VS
4507
for VPS only
I501
2504
470n
3520
470K
for VPS only
3508
270K
3502
68K
100k for VPS
2503
100n
I506
16 IREF
1,5V
17 CVBS_SLICER
1,3V
20
14 PD2IVCO2
2V
I509
12 PD1IVCO1
2,1V
4504
for VPS only
10 DAVNIEHB
5V
Data/Sync-
Slicer and
ACQ. PLL
2507
120p
I511
5502
10u
I510
13 SECAM_BY
1,7V
CVBS
Encoder
VOUT
to IO
3521
100R
delete for VPO
4505
21
15 CVBS_OUT
1,7V
22
VSB
from VS
3512
47R
for VPO only
I512
18 CVBS_IN
1,7V
11 HT_BLANK
3518
1M
for VPS only
3507
3K3
6k8 for VPS
I504
2512
2n2
for VPS only
2505
47n
for VPO only
3519
1M
for VPS only
3509
3K3
6k8 for VPS
I505
2506
100n
X7R
33n for VPS
4503
for VPS only
C501
C500
GNDVPO
GNDVIO

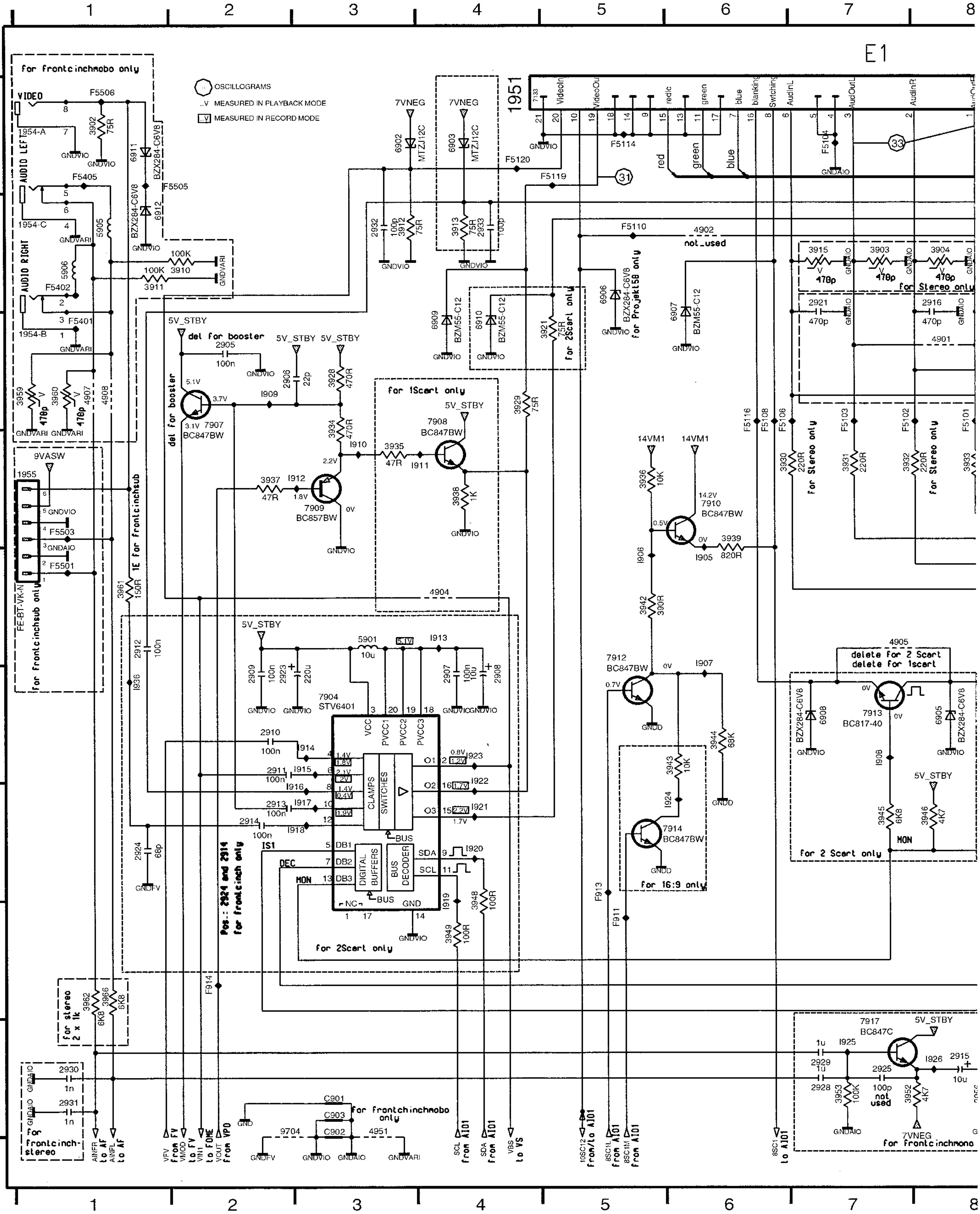
D2 5500 A6 5503 E10 7502 C7 C501 E1 F502 D8 I502 C1 I506 B4 I511 D3 I514 C8 I518 E9
B1 5501 A7 5504 A8 7503 E9 F500 B7 F503 E7 I504 E3 I509 C4 I512 D4 I516 E8 I519 E10
E9 5502 D3 7501 C2 C500 E1 F501 B7 I501 B2 I505 E4 I510 D4 I513 B8 I517 D8 I542 C2

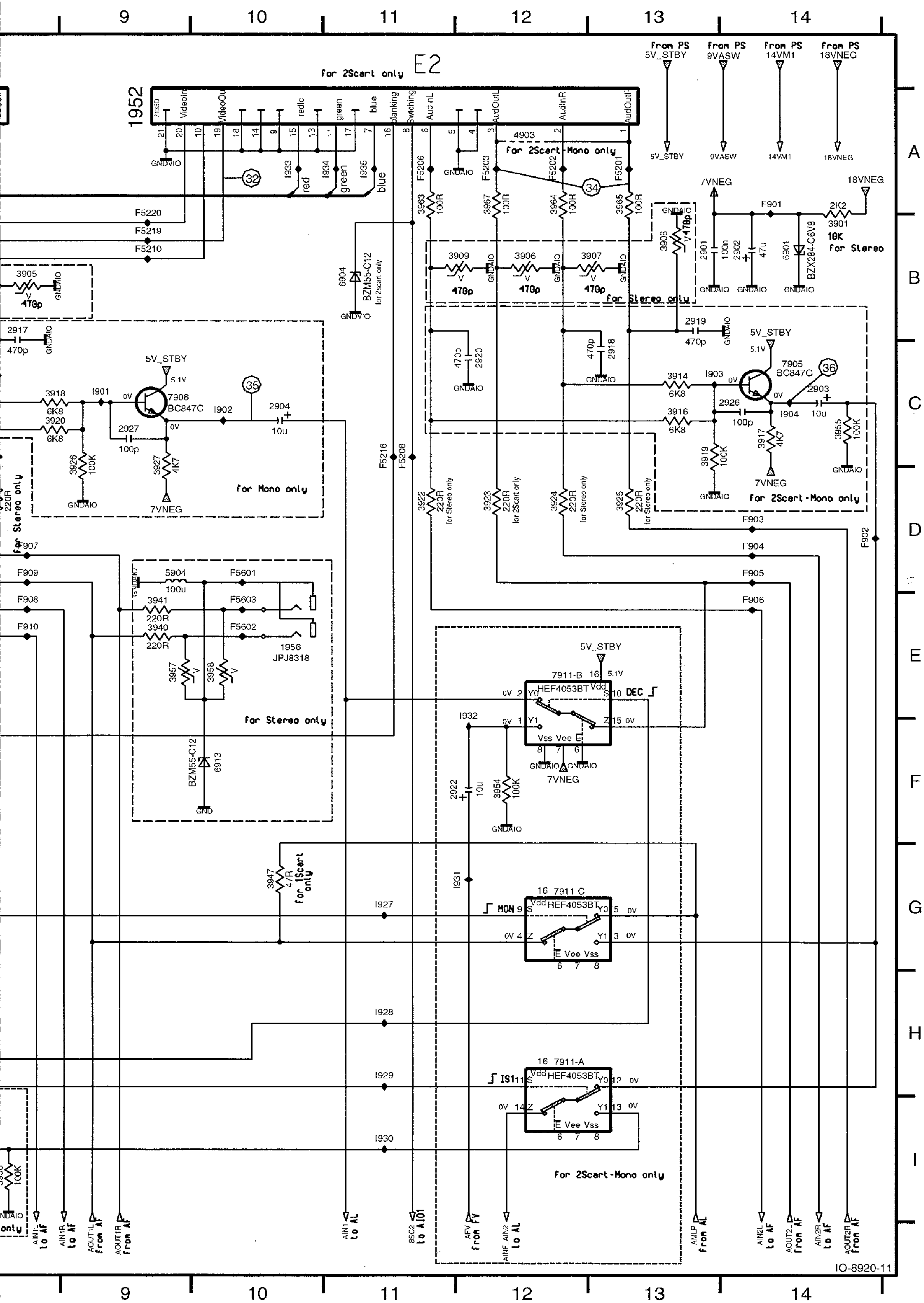

6
7
8
9
10
A
B
C
D
E
5VA
5V_STBY
for VPO only
5500
10u
5501
10u
for VPO only
5504
10u
for VPS only
from PS
5VA
from PS
5V_STBY
5VA
5V_STBY
OSCILLOGRAMS
..V MEASURED IN PLAYBACK MODE
..V MEASURED IN RECORD MODE
4502
for VPS only
2500
220u
2501
100n
2502
100n
F500
F501
5,1V
5,1V
20
19
VDDA
VDDD
Acquisition Timing
I2C - Bus Interface
Data-Acquisition
Memory for sliced Data and OSD Information (512 Byte)
Character Generator
Character ROM
Display Timing Sync/Pixelclock Generation
7502
SDA5652 for VPO
SDA5650 for VPS
SDA
5
5,3V
I513
3504
100R
SDA
from AI01
SCL
4
5,3V
I514
3505
100R
SCL
from AI01
24
SYNC1
9
4.8V
OFP
from AI01
SYNC2
7
1.3V
OSC_OUT
6
1.7V
4501
for VPS only
FSCIOSC_IN
3
1,8V
F502
23
not for VPS
VSSA
VSSD
1
2
8
F503
5VA
5VA
3513
100R
3511
220K
not used
2508
100n
I517
I518
2510
1n
I519
3515
2K2
2FSC
from VS
for VPO only
2509
1n
7503
BC847BW
I516
3517
1K
3516
150K
5503
6u8
2511
47p
4508
for VPO only
VPO-8920-13

Interconnections:

AF page 73	AL page 72	AIO1 page 66	AIO2 page 65	DE page 67	FM ST page 70	FM NIC-page 71
FV page 69	FOME page 78	I/O page 77	PS page 64	VPO page 76	VS page 75	VS_S page 74

7.14 In/Out Part (IO)


E1
1951
OSCILLOGRAMS
..V MEASURED IN PLAYBACK MODE
..V MEASURED IN RECORD MODE
for frontcinchmobo only
VIDEO
AUDIO LEFT
AUDIO RIGHT
1954-A
1954-C
1954-B
F5506
F5405
F5402
F5401
F5505
3902 75R
6911 BZX284-C6V8
6912 BZX284-C6V8
5905
5906
100K 3910
100K 3911
3959 470p
3960 470p
4907
4908
GNDVIO
GNDVARI
GNDAIO
GNDFV
GNDD
9VASW
1955
FE-BT-VK-N
for frontcinchsub only
F5503
F5501
3961 150R
1E for frontcinchsub
5V_STBY
del for booster
2905 100n
2906 22p
3928 470R
3934 470R
7907 BC847BW
7909 BC857BW
3937 47R
3935 47R
I909
I910
I911
I912
for 1Scart only
7908 BC847BW
3938 1K
4904
7VNEG
6902 MTZJ12C
6903 MTZJ12C
2932 100p
3912 75R
3913 75R
2933 100p
F5120
F5119
F5114
F5110
4902 not_used
6906 BZX284-C6V8 for Projekt58 only
6907 BZM55-C12
6909 BZM55-C12
6910 BZM55-C12
3921 75R for 2Scart only
3929 75R
VideoIn
VideoOut
redic
green
blue
blanking
Switching
AudinL
AudOutL
AudinR
red
green
blue
31
33
F5104
3915 470p
3903 470p
3904 470p
for Stereo only
2921 470p
2916 470p
4901
F5116
F5108
F5106
F5103
F5102
F5101
3930 220R for Stereo only
3931 220R
3932 220R for Stereo only
3933
14VM1
3936 10K
7910 BC847BW
3939 820R
I905
I906
3942 390R
7912 BC847BW
I907
3944 68K
3943 10K
I924
7914 BC847BW
for 16:9 only
4905
delete for 2 Scart
delete for 1scart
6908 BZX284-C6V8
7913 BC817-40
6905 BZX284-C6V8
I908
3945 6K8
3946 4K7
MON
for 2 Scart only
2912 100n
I936
2909 100n
2923 220u
5901 10u
5.1V
I913
2907 100n
2908 10u
7904 STV6401
VCC
PVCC1
PVCC2
PVCC3
CLAMPS
SWITCHES
DIGITAL BUFFERS
BUS DECODER
BUS
NC
GND
2910 100n
2911 100n
2913 100n
2914 100n
I914
I915
I916
I917
I918
I919
I920
I921
I922
I923
O1
O2
O3
DB1
DB2
DB3
SDA
SCL
IS1
DEC
MON
3948 100R
3949 100R
2924 68p
Pos.: 2924 and 2914 for frontcinch only
for 2Scart only
F913
F911
F914
3962 6K8
3966 6K8
for stereo 2 x 1k
2930 1n
2931 1n
for frontcinch-stereo
C901
C903
C902
9704
4951
for frontchinchmobo only
AINFR to AF
AINFL to AF
VFV from FV
VMOD to FV
VIN1 to FOME
VOUT from VPD
SCL from AI01
SDA from AI01
VBS to VS
10SC12 from/to AI01
8SC1L from AI01
8SC1M from AI01
8SC1 to AI01
7917 BC847C
2929 1u
2928
I925
I926
2925 100p not used
2915 10u
3953 100K
3952 4K7
for frontcinchmono
1 2 3 4 5 6 7 8
A B C D E F G H I

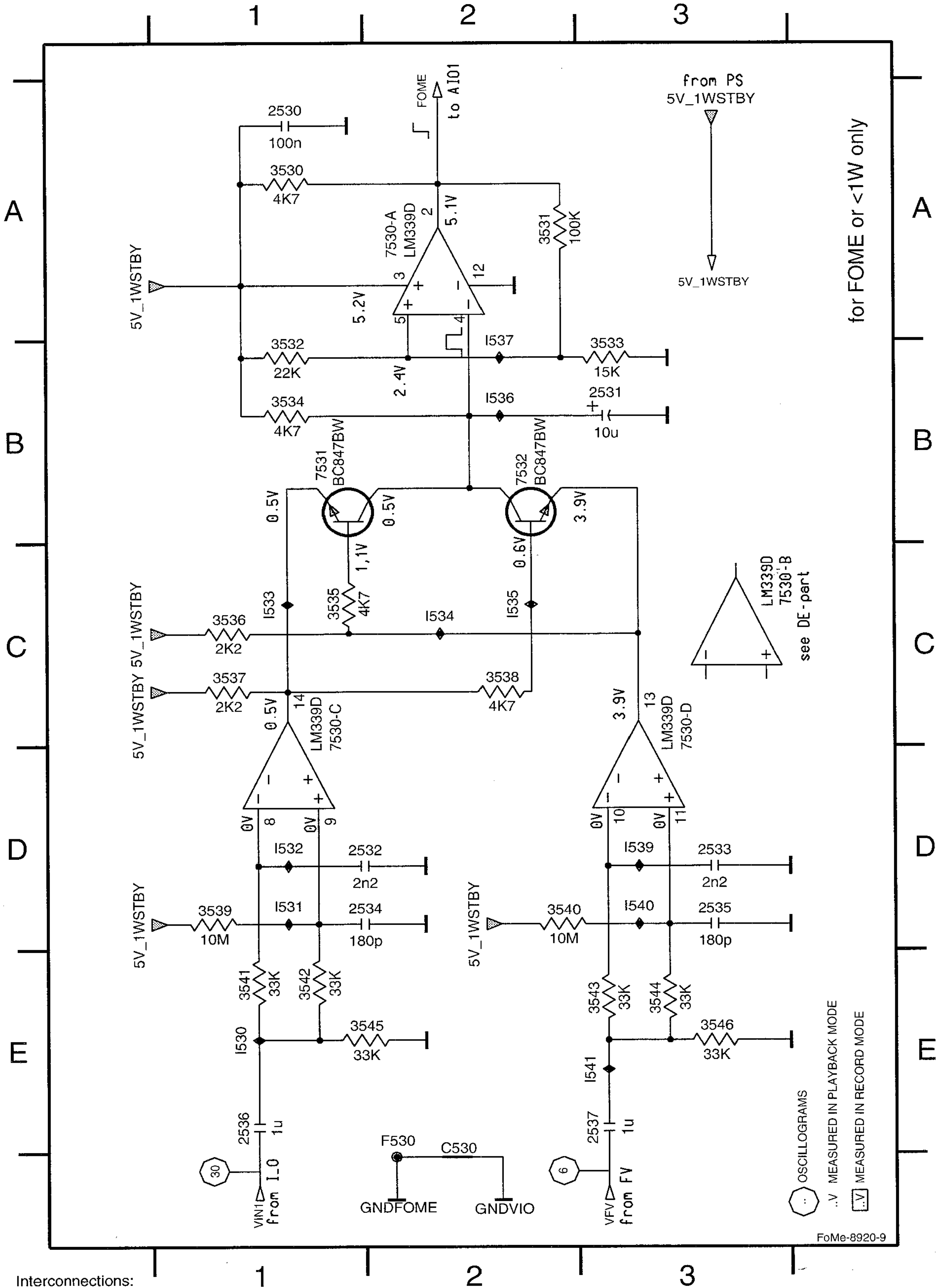

9
10
11
12
13
14
E2
for 2Scart only
1952
From PS 5V_STBY
From PS 9VASW
From PS 14VM1
From PS 18VNEG
5V_STBY
9VASW
14VM1
18VNEG
VideoIn
VideoOut
red
green
blue
blanking
Switching
AudinL
AudOutL
AudInR
AudOutR
GNDVIO
GNDAIO
4903
for 2Scart-Mono only
32
34
35
36
F5220
F5219
F5210
F5206
F5203
F5202
F5201
F5216
F5208
3963 100R
3967 100R
3964 100R
3965 100R
7VNEG
18VNEG
F901
2K2
3901
10K
for Stereo
2901 100n
2902 47u
6901 BZX284-C6V8
3908 470p
3909 470p
3906 470p
3907 470p
3905 470p
for Stereo only
6904 BZM55-C12 for 2scart only
2917 470p
2919 470p
2920 470p
2918 470p
7906 BC847C
7905 BC847C
3918 6K8
3920 6K8
3914 6K8
3916 6K8
I901
I902
I903
I904
2927 100p
2926 100p
2904 10u
2903 10u
3926 100K
3927 4K7
3919 100K
3917 4K7
3955 100K
for Mono only
for 2Scart-Mono only
3922 220R for Stereo only
3923 220R for 2Scart only
3924 220R for Stereo only
3925 220R for Stereo only
F903
F904
F905
F906
F902
F907
F909
F908
F910
5904 100u
F5601
3941 220R
F5603
3940 220R
F5602
1956 JPJ8318
3957
3958
For Stereo only
BZM55-C12 6913
GND
5V_STBY
7911-B HEF4053BT
DEC
I932
2922 10u
3954 100K
7VNEG
I931
3947 47R for 1Scart only
I927
7911-C HEF4053BT
MON
I928
I929
7911-A HEF4053BT
IS1
I930
For 2Scart-Mono only
AIN1L to AF
AIN1R to AF
AOUT1L from AF
AOUT1R from AF
AIN1 to AL
8SC2 to AIO1
AFV from FV
AINF_AIN2 to AL
AMLP from AL
AIN2L to AF
AOUT2L from AF
AIN2R to AF
AOUT2R from AF
IO-8920-11

1951	A4
1952	A9
1954-A	A1
1954-B	C1
1954-C	B1
1955	D1
1956	E10
2901	B13
2902	B14
2903	C14
2904	C10
2905	C2
2906	C2
2907	F4
2908	F4
2909	F2
2910	F2
2911	F2
2912	E1
2913	G2
2914	G2
2915	I8
2916	B8
2917	B8
2918	C13
2919	B13
2920	C12
2921	B7
2922	F12
2923	F3
2924	G1
2925	I7
2926	C14
2927	C9
2928	I7
2929	I7
2930	I1
2931	I1
2932	B3
2933	B4
3901	B14
3902	A1
3903	B7
3904	B8
3905	B8
3906	B12
3907	B13
3908	B13
3909	B12
3910	B2
3911	B1
3912	B3
3913	B4
3914	C13
3915	B7
3916	C13
3917	C14
3918	C8
3919	C13
3920	C8
3921	C5
3922	D11
3923	D12
3924	D12
3925	D13
3926	C9
3927	C9
3928	C3
3929	C4
3930	D6
3931	D7
3932	D7
3933	D8
3934	C3
3935	D3
3936	D5
3937	D2
3938	D4
3939	D6
3940	E9
3941	E9
3942	E5
3943	F6
3944	F6
3945	G7
3946	G8
3947	G10
3948	G4
3949	H4
3952	I7
3953	I7
3954	F12
3955	C14
3956	I8
3957	E9
3958	E10
3959	C1
3960	C1
3961	E1
3962	H1
3963	A11
3964	A12
3965	A13
3966	H1
3967	A12
4901	C8
4902	B6
4903	A12
4904	E4
4905	E7
4907	C1
4908	C1
4951	I3
5901	E3
5904	D9
5905	B1
5906	B1
6901	B14
6902	A3
6903	A4
6904	B11
6905	F8
6906	B5
6907	B6
6908	F7
6909	C4
6910	C4
6911	A1
6912	B1
6913	F10
7904	F3
7905	C14
7906	C9
7907	C2
7908	C4
7909	D3
7910	D6
7911-A	H12
7911-B	E12
7911-C	G12
7912	E5
7913	F7
7914	G5
7917	I7
9704	I2
C901	I3
C902	I3
C903	I3
F5101	C8
F5102	C7
F5103	C7
F5104	A7
F5106	C6
F5108	C6
F5110	B5
F5114	A5
F5116	C6
F5119	A5
F5120	A4
F5201	A13
F5202	A12
F5203	A12
F5206	A11
F5208	C11
F5210	B9
F5216	C11
F5219	B9
F5220	B9
F5401	C1
F5402	B1
F5405	A1
F5501	E1
F5503	D1
F5505	A2
F5506	A1
F5601	D10
F5602	E10
F5603	E10
F901	A14
F902	D14
F903	D14
F904	D14
F905	D14
F906	E14
F907	D8
F908	E8
F909	D8
F910	E8
F911	H5
F913	G5
F914	H2
I901	C9
I902	C10
I903	C13
I904	C14
I905	E6
I906	E5
I907	E6
I908	F7
I909	C2
I910	D3
I911	D4
I912	D3
I913	E4
I914	F3
I915	F3
I916	F3
I917	G3
I918	G3
I919	G4
I920	G4
I921	G4
I922	F4
I923	F4
I924	G6
I925	I7
I926	I8
I927	G11
I928	H11
I929	H11
I930	I11
I931	G12
I932	E12
I933	A10
I934	A11
I935	A11
I936	F1

Interconnections:

AF page 73	AL page 72	AIO1 page 66	AIO2 page 65	DE page 67	FM ST page 70	FM NIC-page 71
FV page 69	FOME page 78	I/O page 77	PS page 64	VPO page 76	VS page 75	VS_S page 74

7.15 FOLLOW ME Part (FOME)

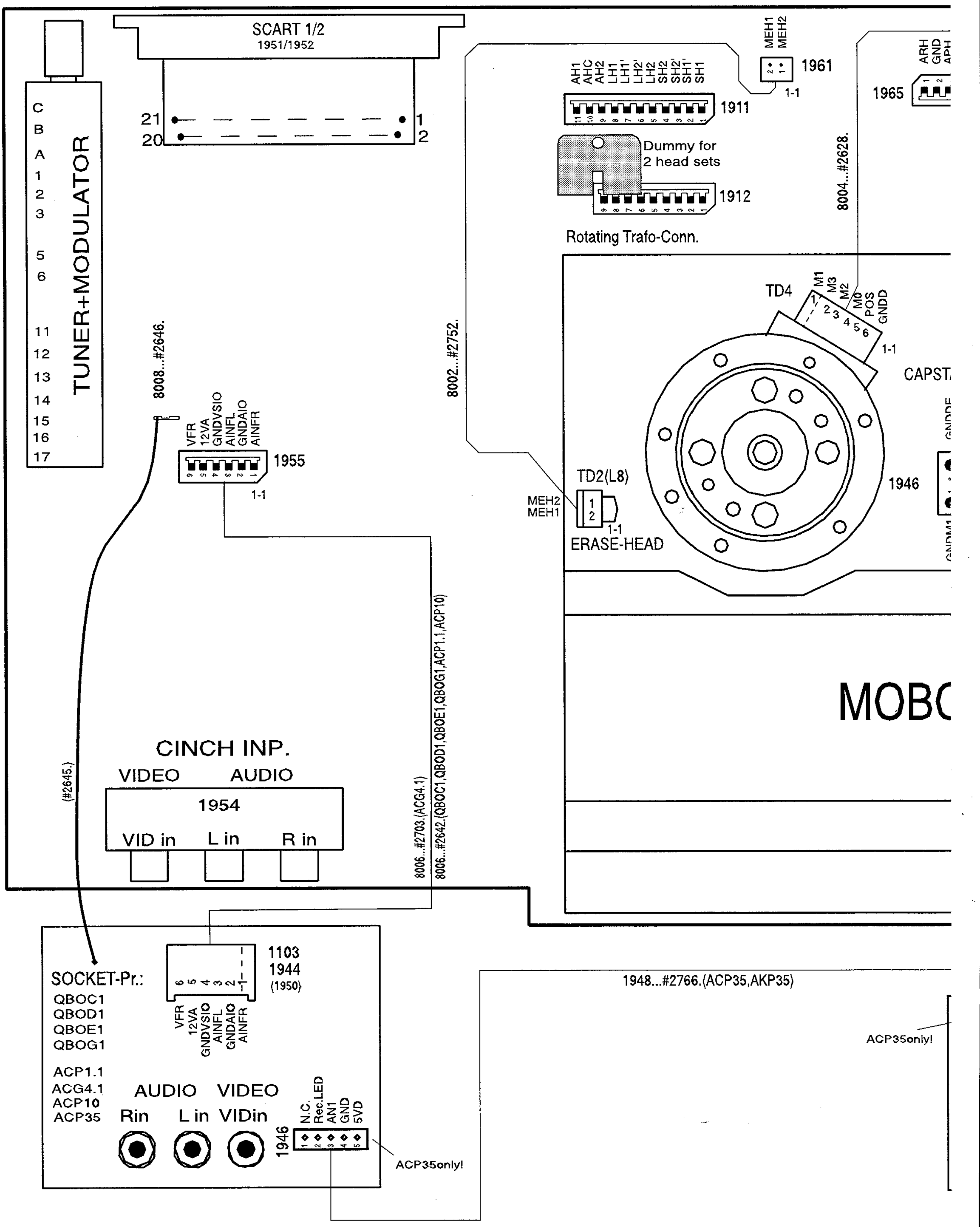

1
2
3
A
B
C
D
E
FOME
to AIO1
from PS
5V_1WSTBY
5V_1WSTBY
for FOME or <1W only
2530
100n
3530
4K7
7530-A
LM339D
2
5.1V
3531
100K
5V_1WSTBY
3
12
5.2V
5
4
3532
22K
2.4V
I537
3533
15K
3534
4K7
I536
2531
10u
7531
BC847BW
7532
BC847BW
0.5V
0.5V
3.9V
1,1V
0.6V
I533
3535
4K7
I535
LM339D
7530-B
see DE-part
5V_1WSTBY
3536
2K2
I534
5V_1WSTBY
3537
2K2
3538
4K7
0.5V
14
LM339D
7530-C
3.9V
13
LM339D
7530-D
0V
8
0V
9
0V
10
0V
11
I532
2532
2n2
I539
2533
2n2
5V_1WSTBY
3539
10M
I531
2534
180p
5V_1WSTBY
3540
10M
I540
2535
180p
3541
33K
3542
33K
3543
33K
3544
33K
I530
3545
33K
3546
33K
I541
2536
1u
2537
1u
30
VIN1
from I_O
F530
C530
GNDFOME
GNDVIO
6
VFV
from FV
OSCILLOGRAMS
.V MEASURED IN PLAYBACK MODE
.V MEASURED IN RECORD MODE
FoMe-8920-9

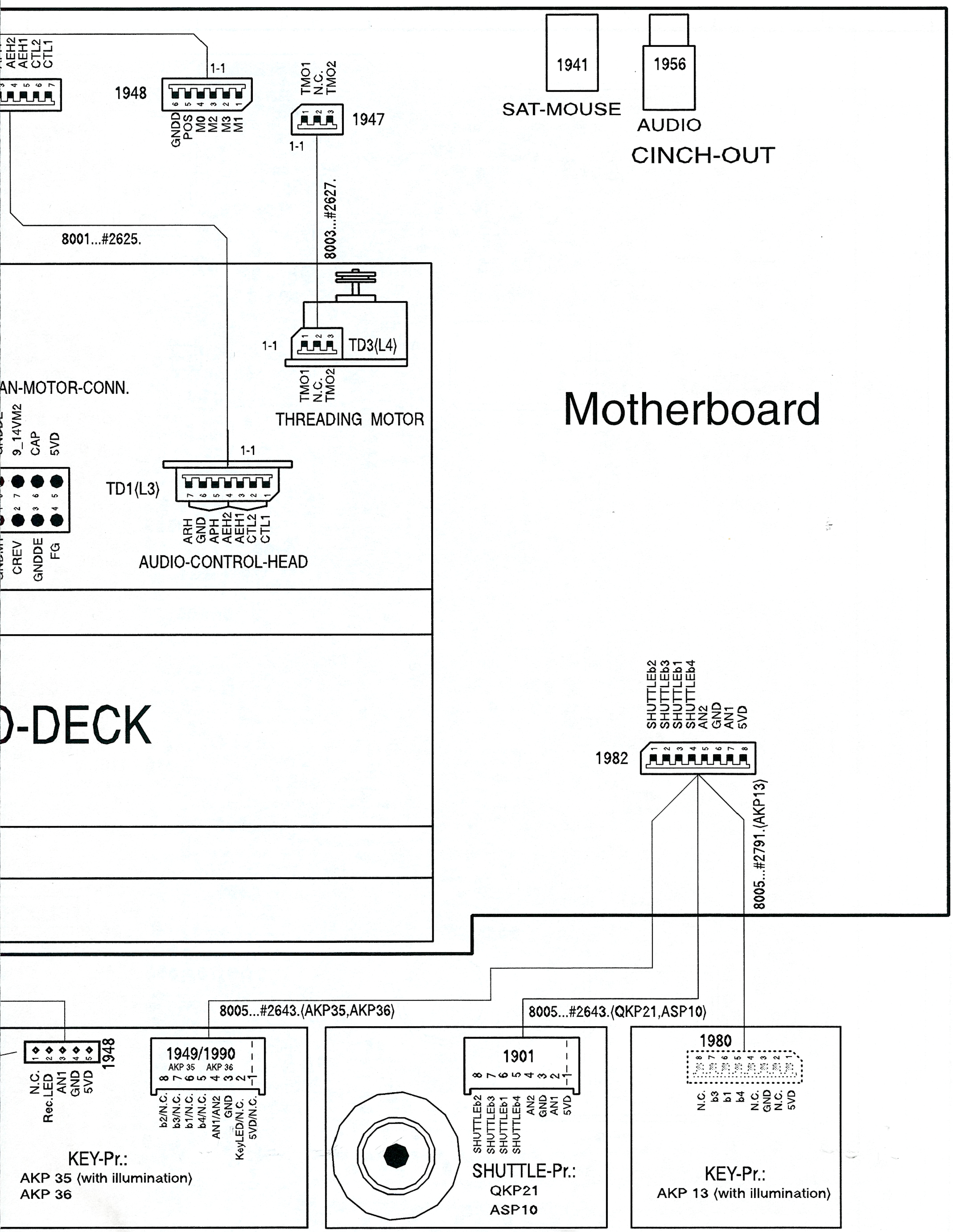
2530	A1
2531	B3
2532	D1
2533	D3
2534	D1
2535	D3
2536	E1
2537	E3
3530	A1
3531	A2
3532	B1
3533	B3
3534	B1
3535	C1
3536	C1
3537	C1
3538	C2
3539	D1
3540	D2
3541	E1
3542	E1
3543	E3
3544	E3
3545	E2
3546	E3
7530-A	A2
7530-C	D1
7530-D	D3
7531	B1
7532	B2
C530	E2
F530	E2
I530	E1
I531	D1
I532	D1
I533	C1
I534	C2
I535	C2
I536	B2
I537	A2
I539	D3
I540	D3
I541	E3

Interconnections:

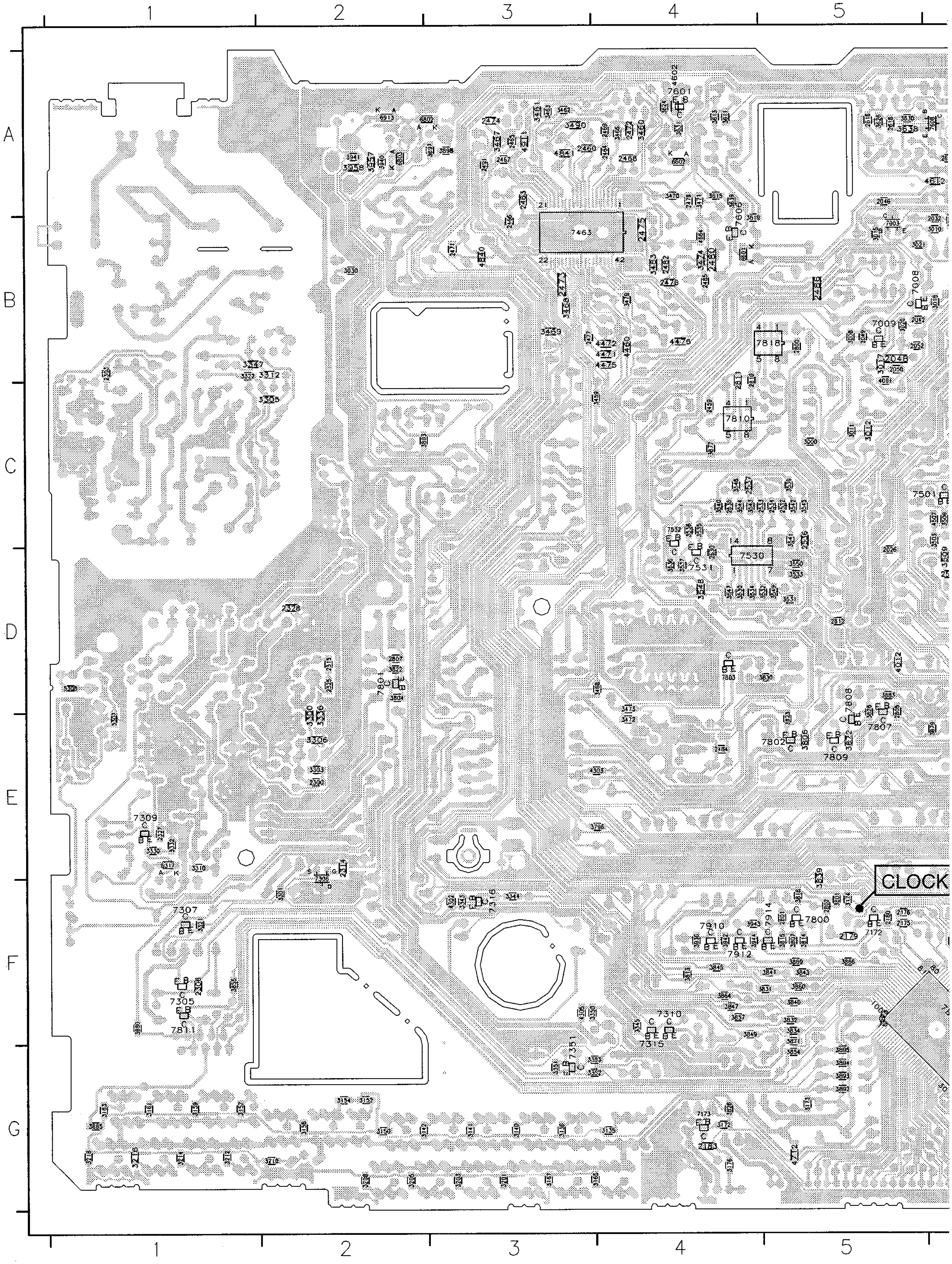
AF page 73	AL page 72	AIO1 page 66	AIO2 page 65	DE page 67	FM ST page 70	FM NIC-page 71
FV page 69	FOME page 78	I/O page 77	PS page 64	VPO page 76	VS page 75	VS_S page 74

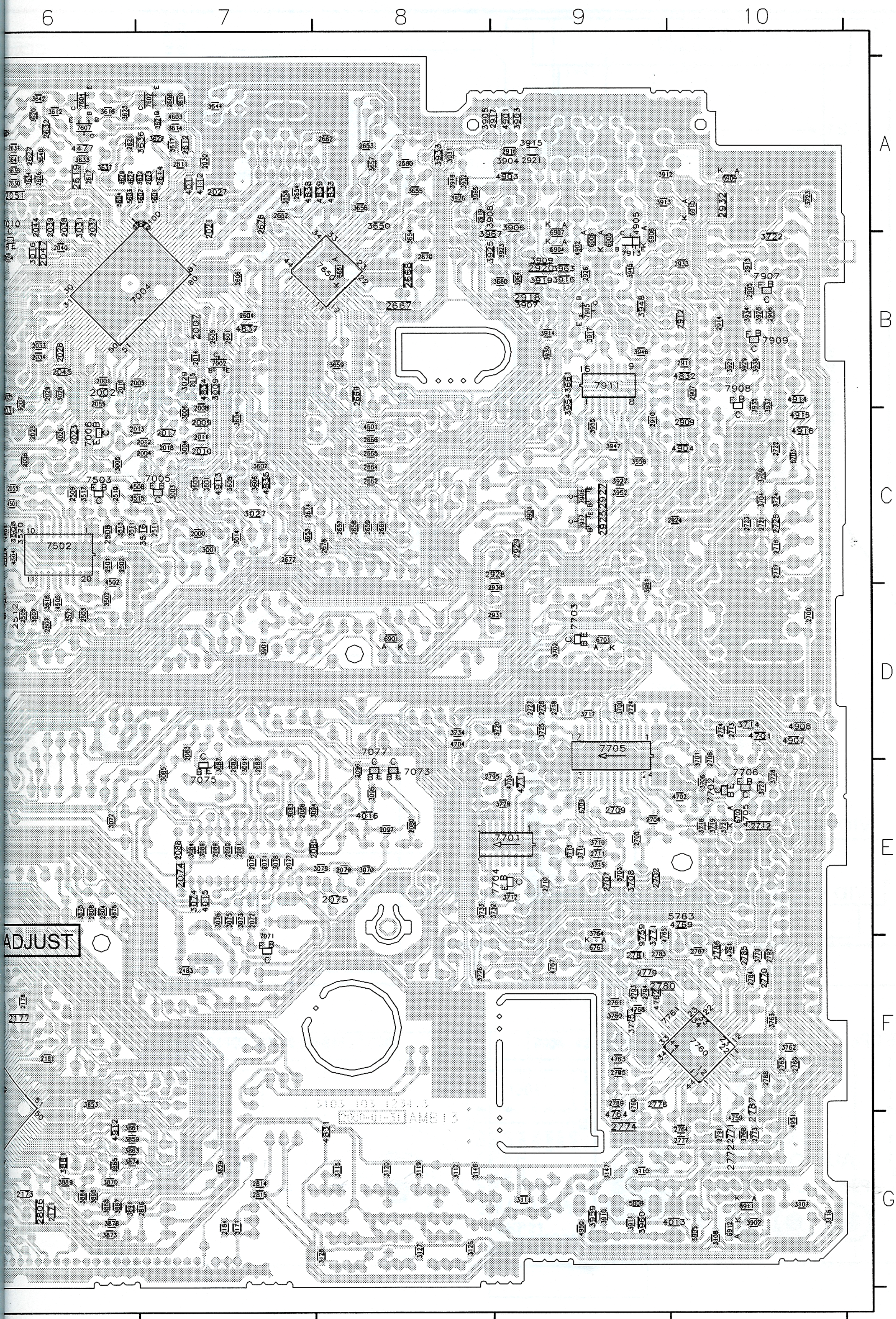
7.16 Wiring Diagram


TUNER+MODULATOR
C
B
A
1
2
3
5
6
11
12
13
14
15
16
17
SCART 1/2
1951/1952
21
20
1
2
8008...#2646.
VFR
12VA
GNDVSIO
AINFL
GNDAIO
AINFR
1955
1-1
8002...#2752.
AH1
AHC
AH2
LH1
LH1'
LH2'
LH2
SH2
SH2'
SH1'
SH1
1911
Dummy for
2 head sets
1912
Rotating Trafo-Conn.
MEH1
MEH2
1961
1-1
8004...#2628.
1965
ARH
GND
TD4
M1
M3
M2
M0
POS
GNDD
1-1
CAPST
GNDDE
GNDM1
1946
TD2(L8)
MEH2
MEH1
1-1
ERASE-HEAD
MOB
CINCH INP.
VIDEO
AUDIO
1954
VID in
L in
R in
(#2645.)
8006...#2703.(ACG4.1)
8006...#2642.(QBOC1,QBOD1,QBOE1,QBOG1,ACP1.1,ACP10)
SOCKET-Pr.:
QBOC1
QBOD1
QBOE1
QBOG1
ACP1.1
ACG4.1
ACP10
ACP35
1103
1944
(1950)
VFR
12VA
GNDVSIO
AINFL
GNDAIO
AINFR
AUDIO
VIDEO
Rin
L in
VIDin
1946
N.C.
Rec.LED
AN1
GND
5VD
ACP35only!
1948...#2766.(ACP35,AKP35)
ACP35only!

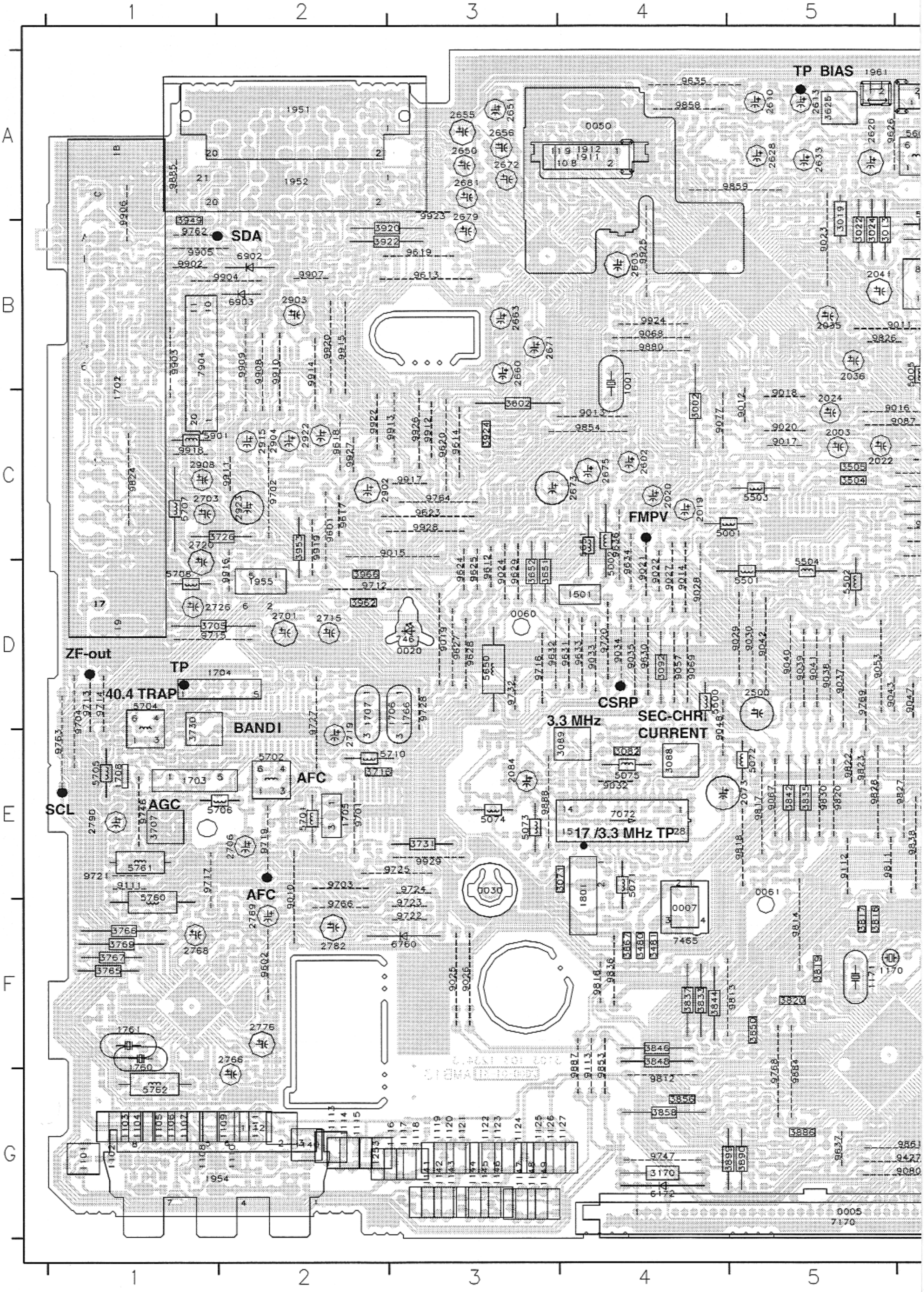

AEH2
AEH1
CTL2
CTL1
1948
1-1
GNDD
POS
M0
M2
M3
M1
TMO1
N.C.
TMO2
1947
1-1
1941
SAT-MOUSE
1956
AUDIO
CINCH-OUT
8001...#2625.
8003...#2627.
1-1
TD3(L4)
TMO1
N.C.
TMO2
THREADING MOTOR
AN-MOTOR-CONN.
9_14VM2
CAP
5VD
CREV
GNDDE
FG
1-1
TD1(L3)
ARH
GND
APH
AEH2
AEH1
CTL2
CTL1
AUDIO-CONTROL-HEAD
Motherboard
-DECK
SHUTTLEb2
SHUTTLEb3
SHUTTLEb1
SHUTTLEb4
AN2
GND
AN1
5VD
1982
8005...#2791.(AKP13)
8005...#2643.(AKP35,AKP36)
8005...#2643.(QKP21,ASP10)
1948
N.C.
Rec.LED
AN1
GND
5VD
1949/1990
AKP 35
AKP 36
8 7 6 5 4 3 2 1
b2/N.C.
b3/N.C.
b1/N.C.
b4/N.C.
AN1/AN2
GND
KeyLED/N.C.
5VD/N.C.
KEY-Pr.:
AKP 35 (with illumination)
AKP 36
1901
8 7 6 5 4 3 2 1
SHUTTLEb2
SHUTTLEb3
SHUTTLEb1
SHUTTLEb4
AN2
GND
AN1
5VD
SHUTTLE-Pr.:
QKP21
ASP10
1980
N.C.
b3
b1
b4
N.C.
GND
N.C.
5VD
KEY-Pr.:
AKP 13 (with illumination)

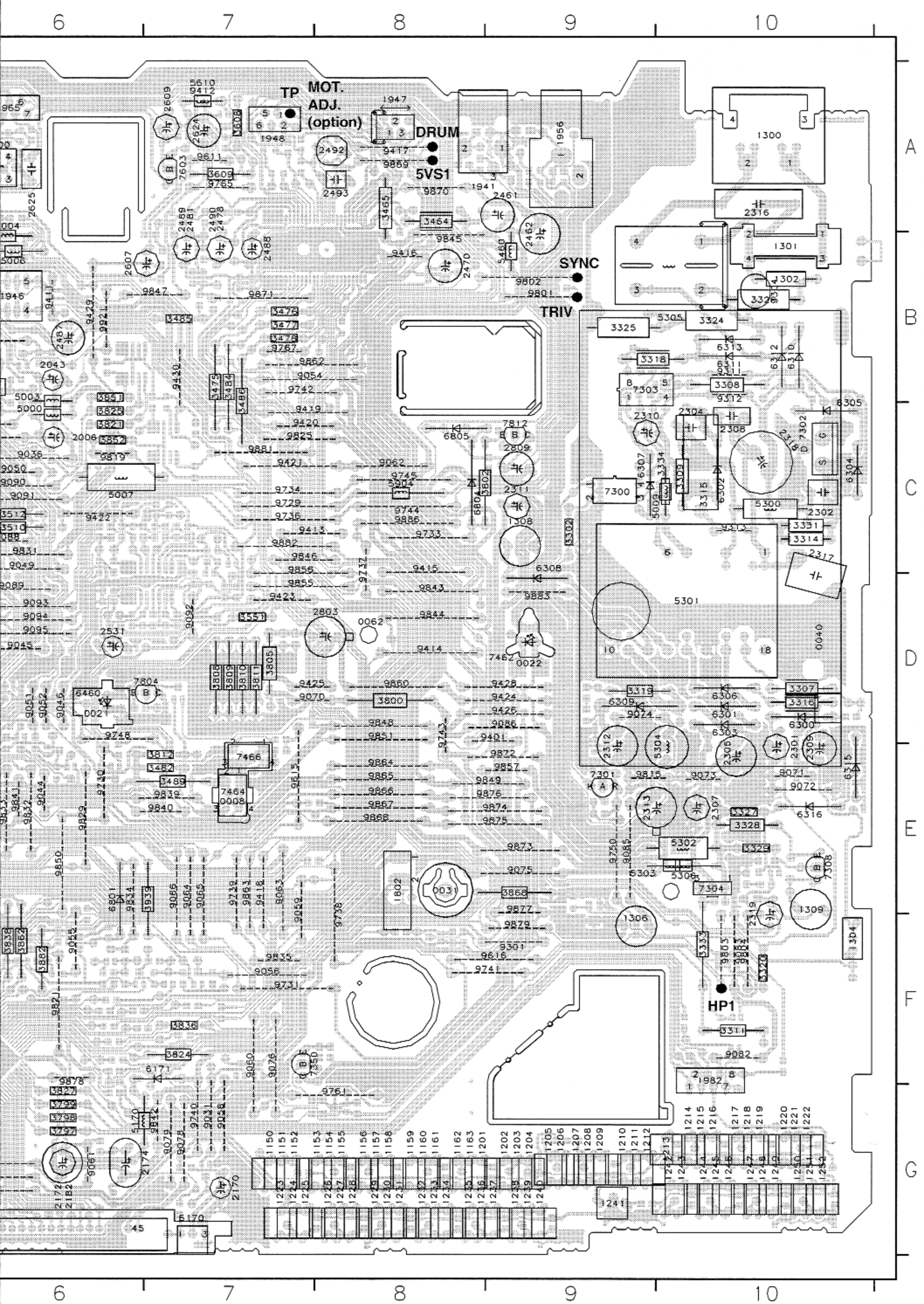
7.17 Mother board - solder side


1
2
3
4
5
A
B
C
D
E
F
G
7463
7601
7818
7810
7530
7531
7501
7008
7009
7803
7802
7809
7808
7807
7804
7309
7307
7305
7811
7316
7310
7315
7351
7910
7912
7914
7800
7172
7173
CLOCK

A
B
C
D
E
F
G
ADJUST
2075
2074
5105 103 1234.3
AMB13

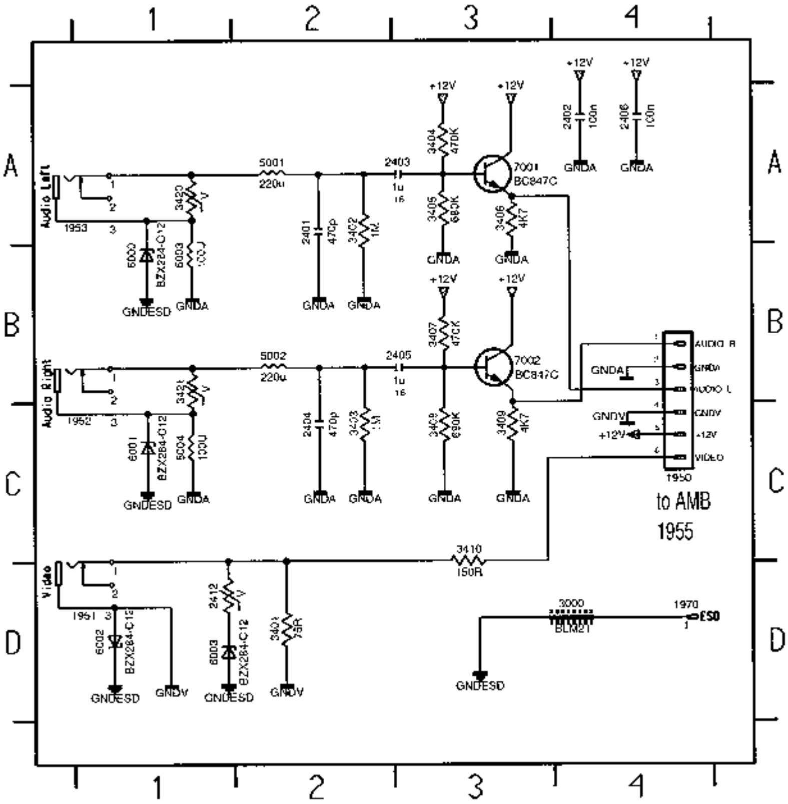
7.18 Mother board - component side


1
2
3
4
5
A
B
C
D
E
F
G
TP BIAS
SDA
FMPV
ZF-out
TP
40.4 TRAP
BANDI
3.3 MHz
CSRP
SEC-CHR
CURRENT
AFC
SCL
AGC
17 /3.3 MHz TP
AFC
1951
1952
0050
1912
1911
1702
7904
1001
1501
1704
1703
1707
1706
1766
1705
0020
0060
0030
1801
0007
7465
7072
1761
1760
1954
0005
7170
1961
2500
0061
1170


6
7
8
9
10
A
B
C
D
E
F
G
TP
MOT.
ADJ.
(option)
DRUM
5VS1
SYNC
TRIV
HP1
1300
1301
1302
5301
1956
1941
1947
1948
1802
1982
1241
0040
0031
0022
0062

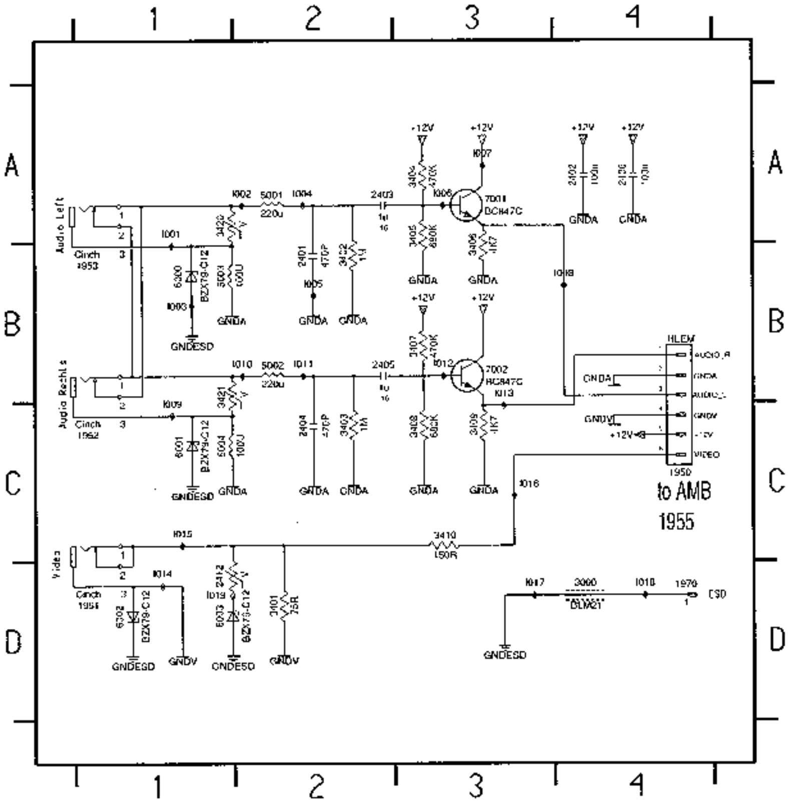
7.19 Connector print (ACP10)

1950	C4	2402	A4	3000	D4	3406	A3	3421	B1	6001	C1
1951	D1	2403	A3	3401	D2	3407	B3	5001	A2	6002	D1
1952	C1	2404	C2	3402	A2	3408	C3	5002	B2	6003	D1
1953	A1	2405	B3	3403	C2	3409	C3	5003	B1	7001	A3
1970	D4	2406	A4	3404	A3	3410	C3	5004	C1	7002	B3
2401	A2	2412	D1	3405	A3	3420	A1	6000	B1		

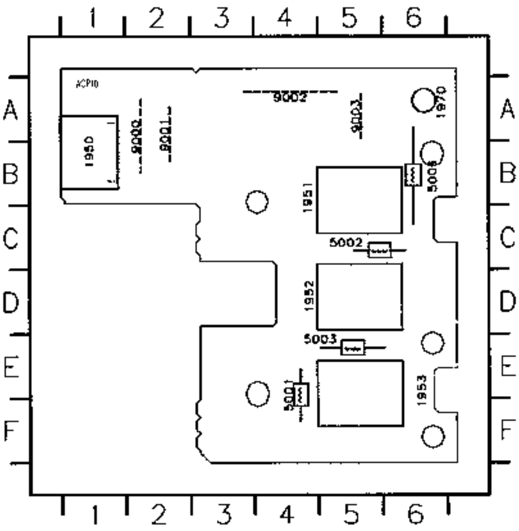

1
2
3
4
A
B
C
D
Audio Left
1953
Audio Right
1952
Video
1951
3420
3421
2412
6000
6001
6002
6003
BZX284-C12
5003
5004
100U
GNDESD
GNDA
GNDV
5001
5002
220u
2401
2404
470p
3402
3403
1M
2403
2405
1u
16
3404
3407
470K
3405
3408
680K
3406
3409
4K7
7001
7002
BC847C
+12V
2402
2406
100n
3410
150R
3401
75R
3000
BLM21
1970
ESD
AUDIO R
GNDA
AUDIO L
GNDV
+12V
VIDEO
1950
to AMB
1955

7.20 Connector print (ACP1)

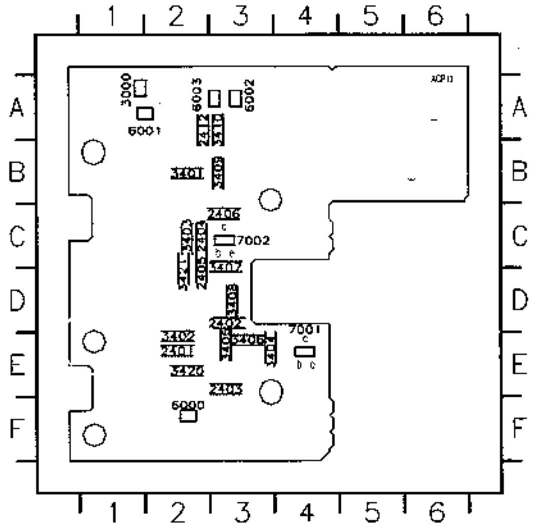
1950	C4	2402	A4	3000	D4	3406	A3	3421	B1	6001	C1
1951	D1	2403	A3	3401	D2	3407	B3	5001	A2	6002	D1
1952	C1	2404	C2	3402	A2	3408	C3	5002	B2	6003	D1
1953	A1	2405	B3	3403	C2	3409	C3	5003	B1	7001	A3
1970	D4	2406	A4	3404	A3	3410	C3	5004	C1	7002	B3
2401	A2	2412	D1	3405	A3	3420	A1	6000	B1		


1
2
3
4
A
B
C
D
Audio Left
Cinch
1953
Audio Rechts
Cinch
1952
Video
Cinch
1951
I001
I002
I003
I004
I005
I006
I007
I008
I009
I010
I011
I012
I013
I014
I015
I016
I017
I018
I019
3420
3421
2412
6000
6001
6002
6003
BZX79-C12
5003
5004
100U
GNDESD
GNDA
GNDV
5001
5002
220u
2401
2404
470P
3402
3403
1M
2403
2405
1u
16
3404
3407
470K
3405
3408
680K
3406
3409
4K7
7001
7002
BC847C
+12V
2402
2406
100n
3410
150R
3401
75R
3000
BLM21
1970
ESD
HLEM
AUDIO_R
GNDA
AUDIO_L
GNDV
+12V
VIDEO
1950
to AMB
1955

7.21 Connector print lay out (ACP10)

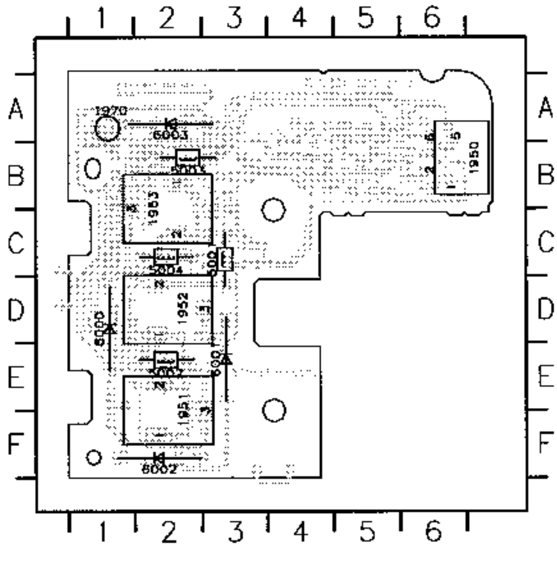

1 2 3 4 5 6
A B C D E F
ACP10
1950
1951
1952
1953
1970
5001
5002
5003
5004
9000
9001
9002
9003

1950	B1
1951	B4
1952	D4
1953	E6
1970	A6
5001	E4
5002	C5
5003	E5
5004	B6
9000	A2
9001	A2
9002	A4
9003	A5

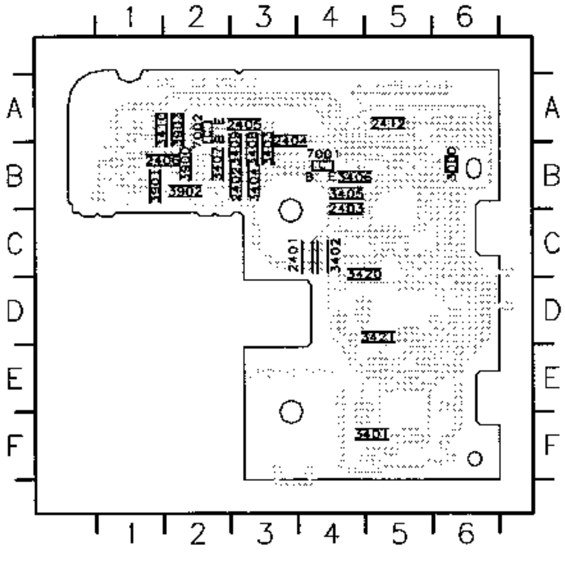

1 2 3 4 5 6
A B C D E F
ACP10
3000
6001
6003
6002
2412
3410
3401
3409
2406
7002
3403
2404
3421
2405
3407
3408
2402
3402
2401
3404
3406
3405
7001
3420
2403
6000

2401	E2
2402	D3
2403	E3
2404	C2
2405	D2
2406	C3
2412	A2
3000	A1
3401	B2
3402	E2
3403	C2
3404	E3
3405	E3
3406	E3
3407	C3
3408	D3
3409	B3
3410	A3
3420	E2
3421	D2
6000	F2
6001	A2
6002	A3
6003	A2
7001	D4
7002	C3

7.22 Connector print lay out (ACP1)

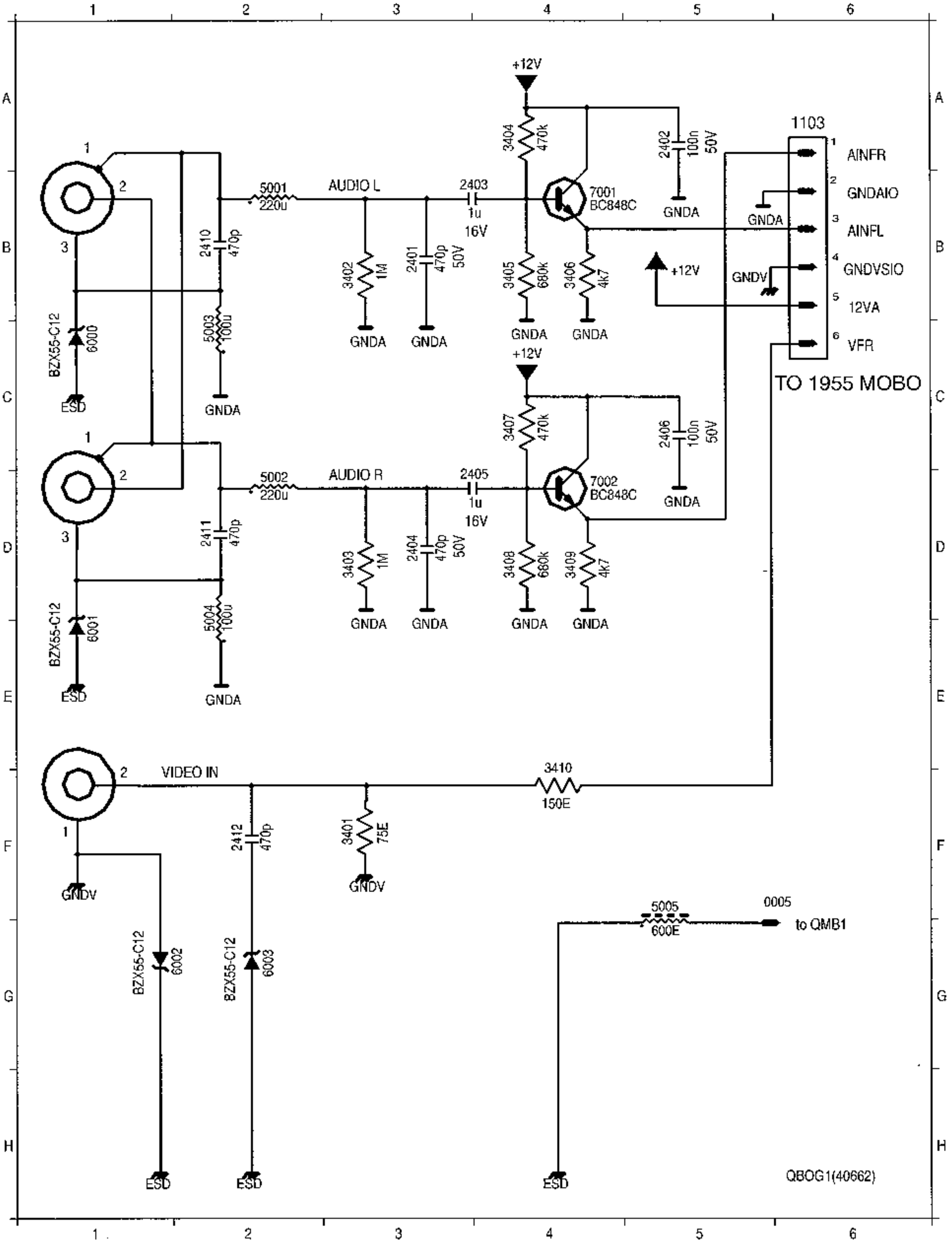

1 2 3 4 5 6
A B C D E F
1970
6003
5003
1953
5004
5001
1952
6000
6001
5002
1951
6002
1950

1950	B6
1951	E2
1952	D2
1953	C2
1970	A1
5001	C3
5002	E2
5003	B2
5004	C2
6000	D1
6001	E3
6002	F2
6003	A2


1 2 3 4 5 6
A B C D E F
3410
3903
7002
2405
2404
2412
2406
3900
3901
3902
3407
2402
3403
3404
3408
3409
7001
3406
3405
2403
3000
2401
3402
3420
3421
3401

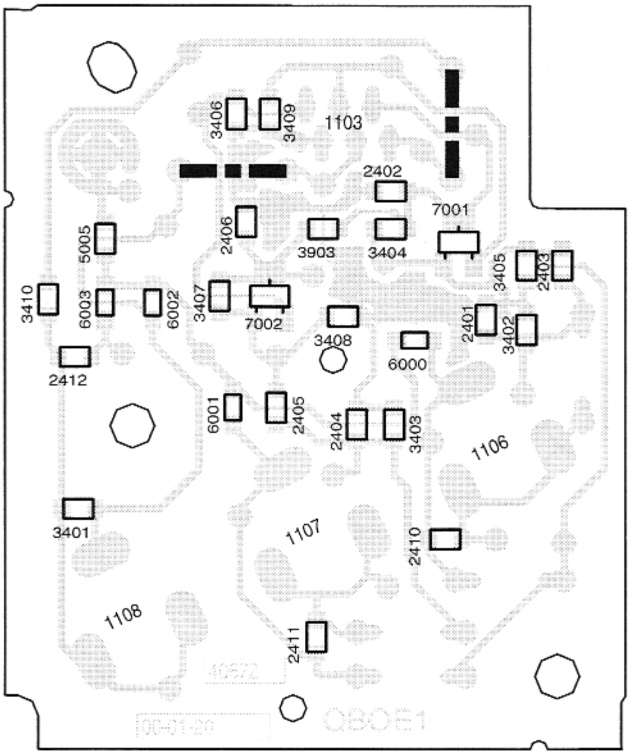
2401	C4
2402	B3
2403	B4
2404	A3
2405	A3
2406	B1
2412	A5
3000	B6
3401	F5
3402	C4
3403	B3
3404	B3
3405	B4
3406	B4
3407	B2
3408	B3
3409	B3
3410	A1
3420	C4
3421	D5
3900	B2
3901	B1
3902	B2
3903	A2
7001	B4
7002	A2

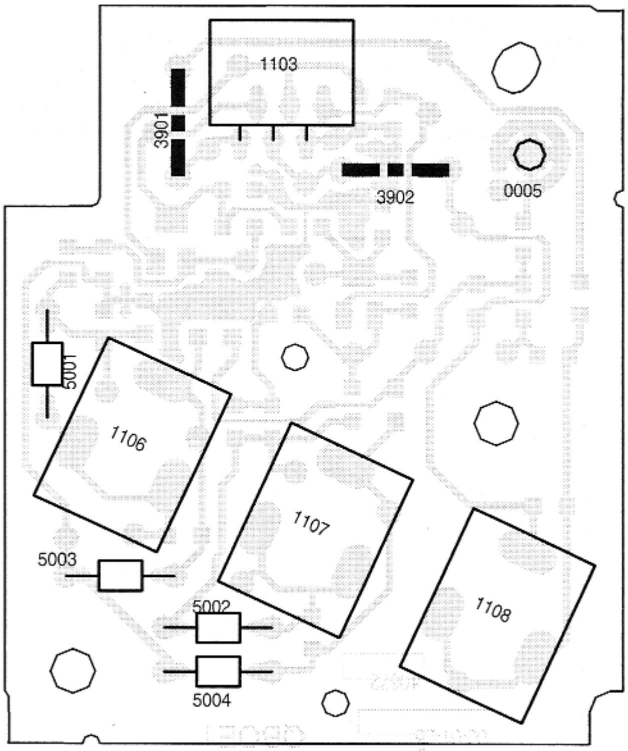
7.23 Connector print (QBOE1, QBOG1)


1
2
3
4
5
6
A
B
C
D
E
F
G
H
+12V
3404
470k
2402
100n
50V
GNDA
1103
1
AINFR
2
GNDAIO
GNDA
3
AINFL
4
GNDVSIO
GNDV
+12V
5
12VA
6
VFR
TO 1955 MOBO
5001
220u
AUDIO L
2403
1u
16V
7001
BC848C
2410
470p
3402
1M
2401
470p
50V
3405
680k
3406
4k7
GNDA
BZX55-C12
6000
5003
100u
ESD
+12V
3407
470k
2406
100n
50V
5002
220u
AUDIO R
2405
1u
16V
7002
BC848C
2411
470p
3403
1M
2404
470p
50V
3408
680k
3409
4k7
BZX55-C12
6001
5004
100u
VIDEO IN
3410
150E
2412
470p
3401
75E
GNDV
5005
600E
0005
to QMB1
BZX55-C12
6002
BZX55-C12
6003
QBOG1(40662)

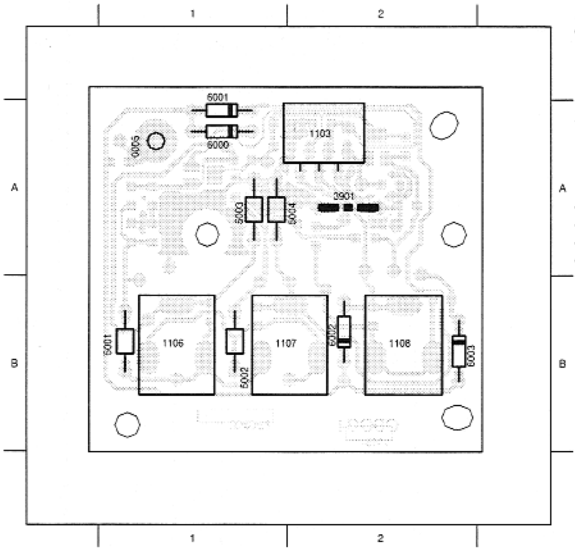
0005	F 5
1103	C 6
2401	B 3
2402	A 5
2403	B 4
2404	D 3
2405	D 4
2406	C 5
2410	B 1
2411	D 1
2412	F 2
3401	F 3
3402	B 3
3403	D 3
3404	A 4
3405	B 4
3406	B 4
3407	C 4
3408	D 4
3409	D 4
3410	F 4
5001	B 2
5002	D 2
5003	C 1
5004	D 1
5005	F 5
6000	C 1
6001	E 1
6002	G 2
6003	G 2
7001	B 4
7002	D 4

7.24 Connector print (QBOE1)

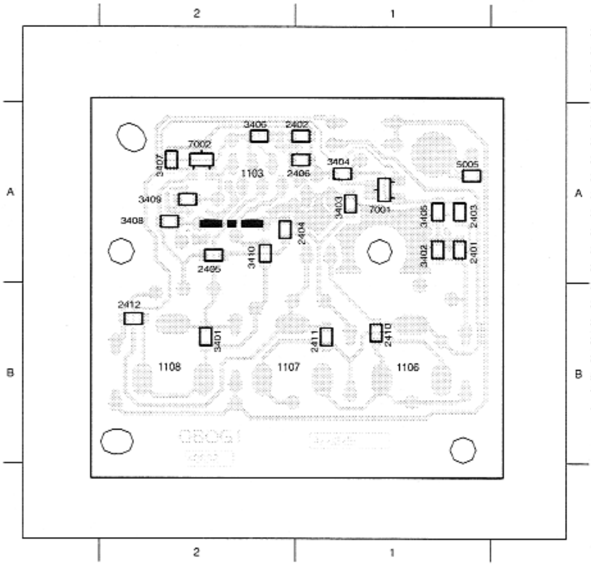

3406
3409
1103
2402
7001
2406
3903
3404
5005
3405
2403
3410
6003
6002
3407
7002
3408
2401
3402
6000
2412
6001
2405
2404
3403
1106
3401
1107
2410
1108
2411
QBOE1


1103
3901
3902
0005
5001
1106
1107
5003
5002
1108
5004

7.25 Connector print (QBOG1)


1
2
A
B
6001
6000
0005
1103
5003
5004
3901
5001
1106
5002
1107
6002
1108
6003

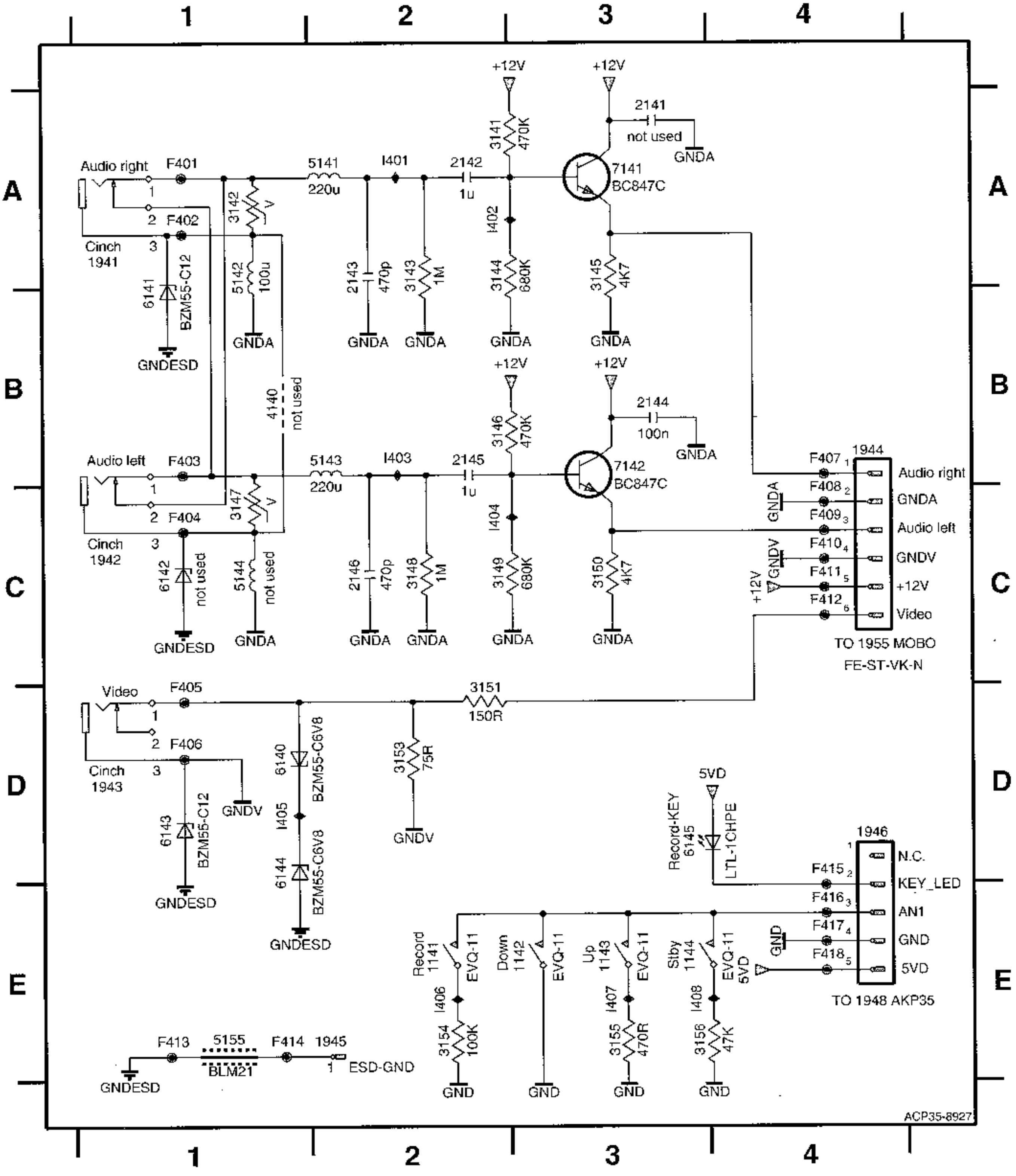
0005	A	1
1103	A	2
1106	B	1
1107	B	1
1108	B	2
3901	A	2
5001	B	1
5002	B	1
5003	A	1
5004	A	1
6000	A	1
6001	A	1
6002	B	2
6003	B	2

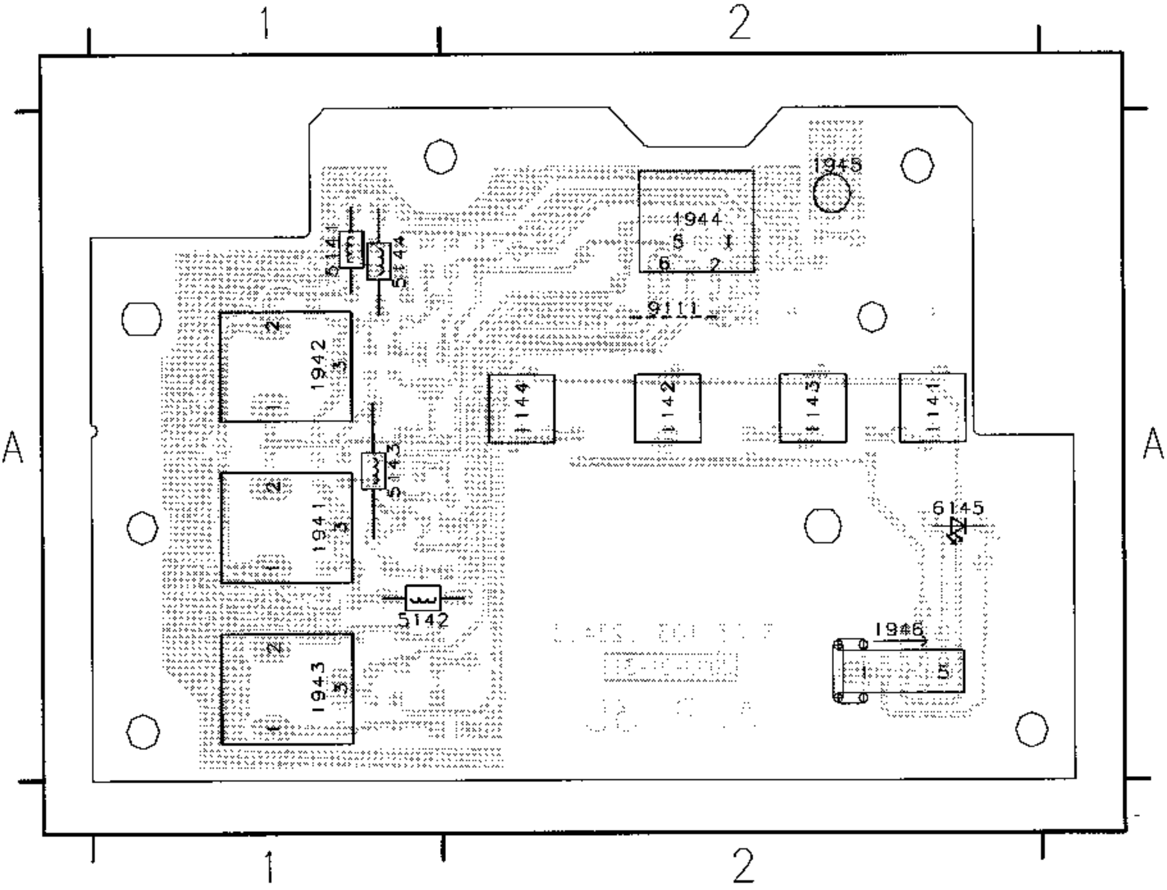

2
1
A
B
3405
2402
7002
3407
2406
1103
3404
5005
3409
3403
7001
3406
2403
3408
2404
3410
3402
2401
2405
2412
3401
2411
2410
1108
1107
1106
QBOG1

2401	A	
2402	A	
2403	A	
2404	A	
2405	A	
2406	A	
2410	B	
2411	B	
2412	B	
3401	B	
3402	A	
3403	A	
3404	A	
3405	A	
3406	A	
3407	A	
3408	A	
3409	A	
3410	A	
5005	A	
7001	A	
7002	A	

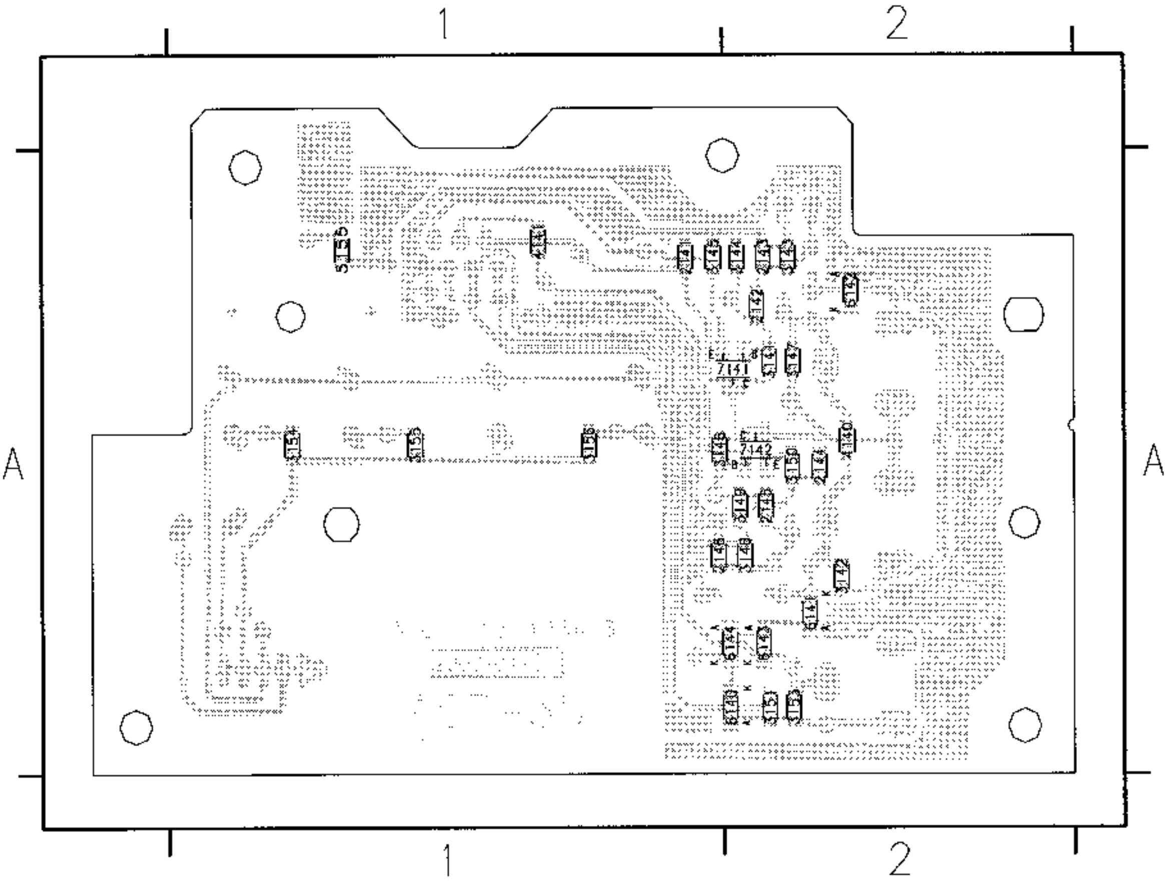
7.26 Connector print (ACP35)

1141 E2	1943 D1	2143 A2	3143 A2	3149 C2	3156 E3	5145 E1	6145 D3	F404 C1	F410 C4	F416 E4	I404 C2
1142 E3	1944 B4	2144 B3	3144 A2	3150 C3	4140 B1	6140 D1	7141 A3	F405 D1	F411 C4	F417 E4	I405 D1
1143 E3	1945 E2	2145 B2	3145 A3	3151 D2	5141 A2	6141 B1	7142 B3	F406 D1	F412 C4	F418 E4	I406 E2
1144 E3	1946 D4	2146 C2	3146 B2	3153 D2	5142 A1	6142 C1	F401 A1	F407 B4	F413 E1	I401 A2	I407 E3
1941 A1	2141 A3	3141 A2	3147 C1	3154 E2	5143 B2	6143 D1	F402 A1	F408 C4	F414 E1	I402 A2	I408 E3
1942 C1	2142 A2	3142 A1	3148 C2	3155 E3	5144 C1	6144 D1	F403 B1	F409 C4	F415 D4	I403 B2	


1
2
3
4
A
B
C
D
E
+12V
+12V
2141
not used
GNDA
3141
470K
7141
BC847C
Audio right
F401
5141
220u
I401
2142
1u
1
2
F402
3142
V
I402
Cinch
1941
3
6141
BZM55-C12
5142
100u
2143
470p
3143
1M
3144
680K
3145
4K7
GNDESD
GNDA
GNDA
GNDA
GNDA
GNDA
+12V
+12V
4140
not used
3146
470K
2144
100n
GNDA
7142
BC847C
Audio left
F403
5143
220u
I403
2145
1u
1
2
F404
3147
V
I404
Cinch
1942
3
6142
not used
5144
not used
2146
470p
3148
1M
3149
680K
3150
4K7
GNDESD
GNDA
GNDA
GNDA
GNDA
GNDA
F407
1944
Audio right
F408
GNDA
GNDA
F409
Audio left
F410
GNDV
GNDV
F411
+12V
+12V
F412
Video
TO 1955 MOBO
FE-ST-VK-N
Video
F405
3151
150R
1
2
F406
Cinch
1943
3
GNDV
6140
BZM55-C6V8
I405
6144
BZM55-C6V8
6143
BZM55-C12
GNDESD
GNDESD
3153
75R
GNDV
5VD
Record-KEY
6145
LTL-1CHPE
1946
N.C.
F415
KEY_LED
F416
AN1
F417
GND
GND
F418
5VD
5VD
TO 1948 AKP35
Record
1141
EVQ-11
Down
1142
EVQ-11
Up
1143
EVQ-11
Stby
1144
EVQ-11
I406
3154
100K
3155
470R
I407
I408
3156
47K
GND
GND
GND
GND
F413
5155
BLM21
F414
1945
1
ESD-GND
GNDESD
ACP35-8927


1
2
A
1944
5
1
6
2
1945
5141
5144
9111
1942
1941
1943
1144
1142
1143
1141
5143
5142
6145
1946

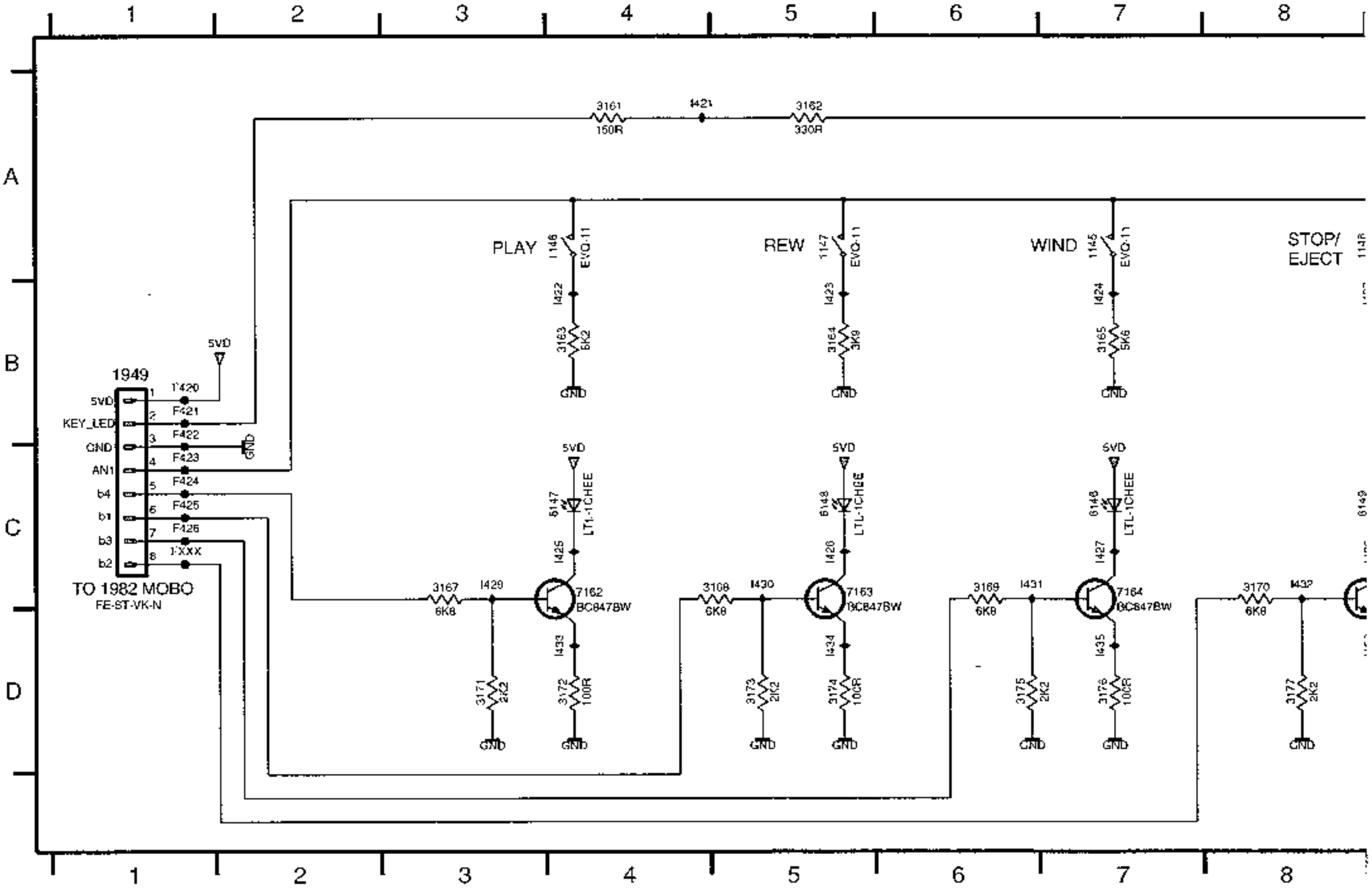
1141	A2
1142	A2
1143	A2
1144	A2
1941	A1
1942	A1
1943	A1
1944	A2
1945	A2
1946	A2
5141	A1
5142	A1
5143	A1
5144	A1
6145	A2
9111	A2

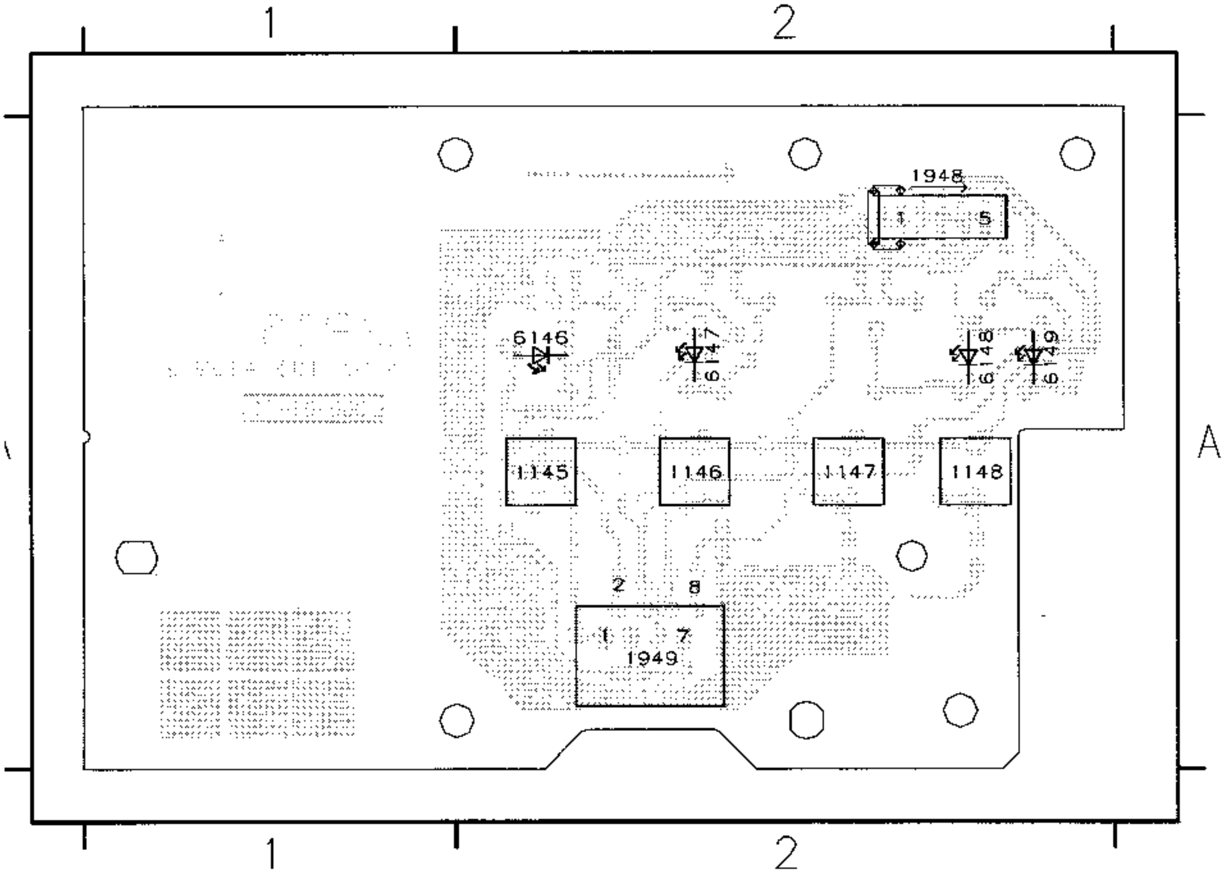

1
2
A
7141
7142

2141	A1
2142	A2
2143	A2
2144	A2
2145	A2
2146	A1
3141	A2
3142	A2
3143	A2
3144	A2
3145	A1
3146	A1
3147	A2
3148	A2
3149	A2
3150	A2
3151	A2
3153	A2
3154	A1
3155	A1
3156	A1
4140	A2
4141	A1
5155	A1
6140	A2
6141	A2
6142	A2
6143	A2
6144	A2
7141	A2
7142	A2

7.27 Key print (AKP35)

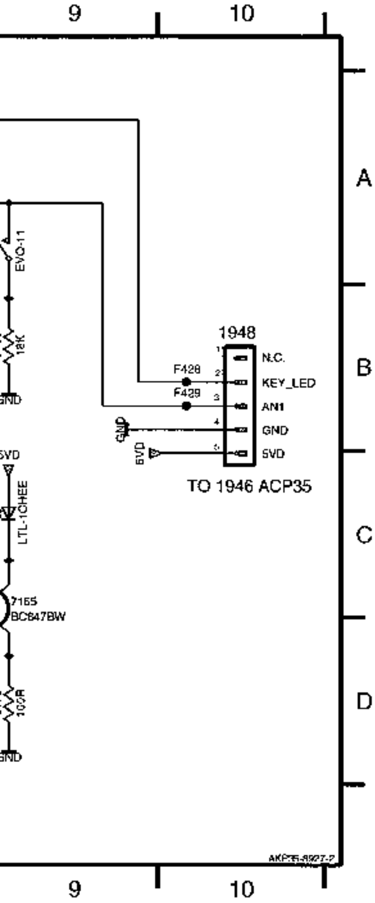
1145	A7
1146	A4
1147	A5
1148	A6
1948	B10
1949	B1
3161	A4
3162	A5
3163	B4
3164	B5
3165	B7
3166	B9
3167	C3
3168	C5
3169	C6
3170	C8
3171	D3
3172	D4
3173	D5
3174	D5
3175	D6
3176	D7
3177	D8
3178	D9
6146	C7
6147	C4
6148	C5
6149	C8
7162	C4
7163	C5
7164	C7
7165	C9
F420	B1
F421	B1
F422	B1
F423	C1
F424	C1
F425	C1
F426	C1
F428	B10
F429	B10
FXXX	C1
I421	A4
I422	B4
I423	B5
I424	B7
I425	C4
I426	C5
I427	C7
I428	C9
I429	C3
I430	C5
I431	C6
I432	C8
I433	D4
I434	D5
I435	D7

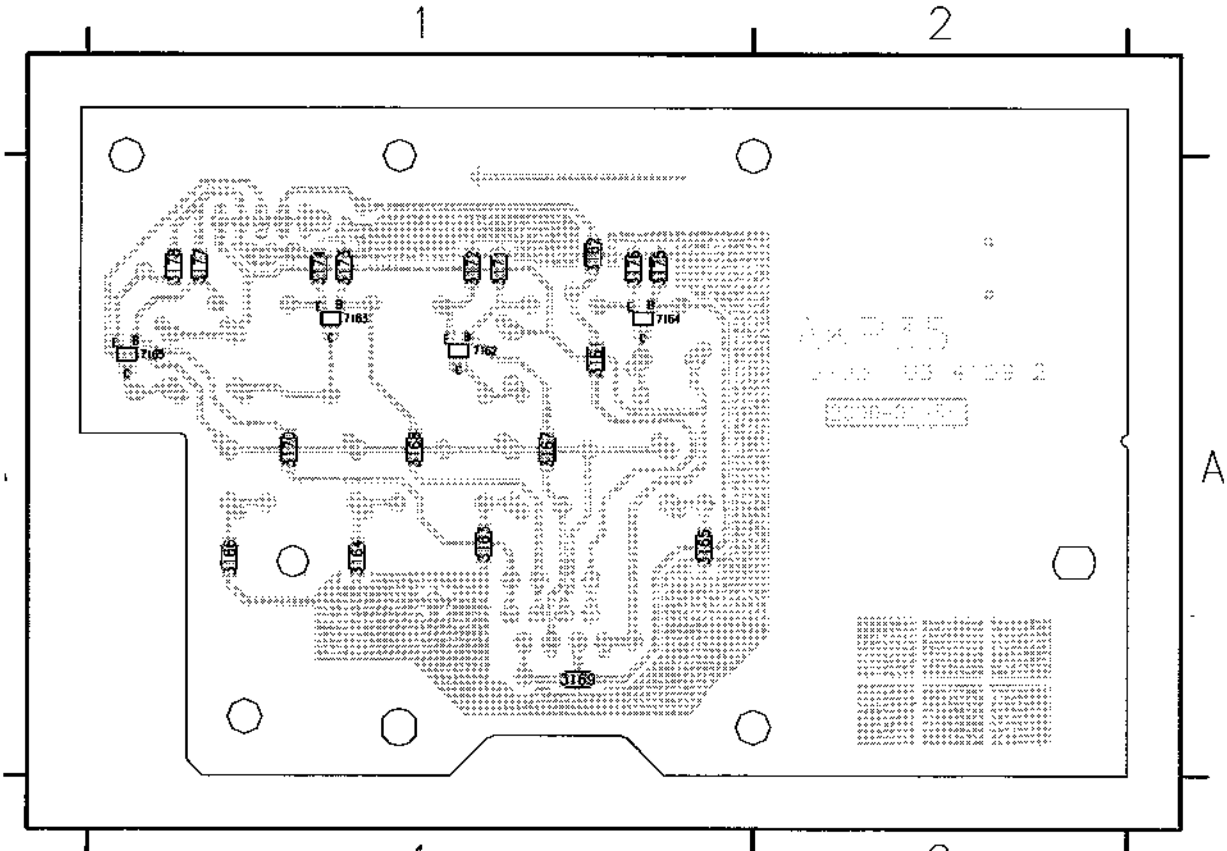

1
2
3
4
5
6
7
8
A
B
C
D
3161
150R
I421
3162
330R
PLAY
1146
EVQ-11
REW
1147
EVQ-11
WIND
1145
EVQ-11
STOP/
EJECT
I422
3163
6K2
I423
3164
3K9
I424
3165
5K6
GND
5VD
1949
5VD
KEY_LED
GND
AN1
b4
b1
b3
b2
1
2
3
4
5
6
7
8
F420
F421
F422
F423
F424
F425
F426
FXXX
TO 1982 MOBO
FE-ST-VK-N
6147
LTL-1CHEE
6148
LTL-1CHEE
6146
LTL-1CHEE
6149
I425
I426
I427
3167
6K8
I429
7162
BC847BW
3168
6K8
I430
7163
BC847BW
3169
6K8
I431
7164
BC847BW
3170
6K8
I432
I433
I434
I435
3171
2K2
3172
100R
3173
2K2
3174
100R
3175
2K2
3176
100R
3177
2K2


1
2
A
1948
1
5
6146
6147
6148
6149
1145
1146
1147
1148
2
8
1
7
1949

1145	A
1146	A
1147	A
1148	A
1948	A
1949	A
6146	A
6147	A
6148	A
6149	A

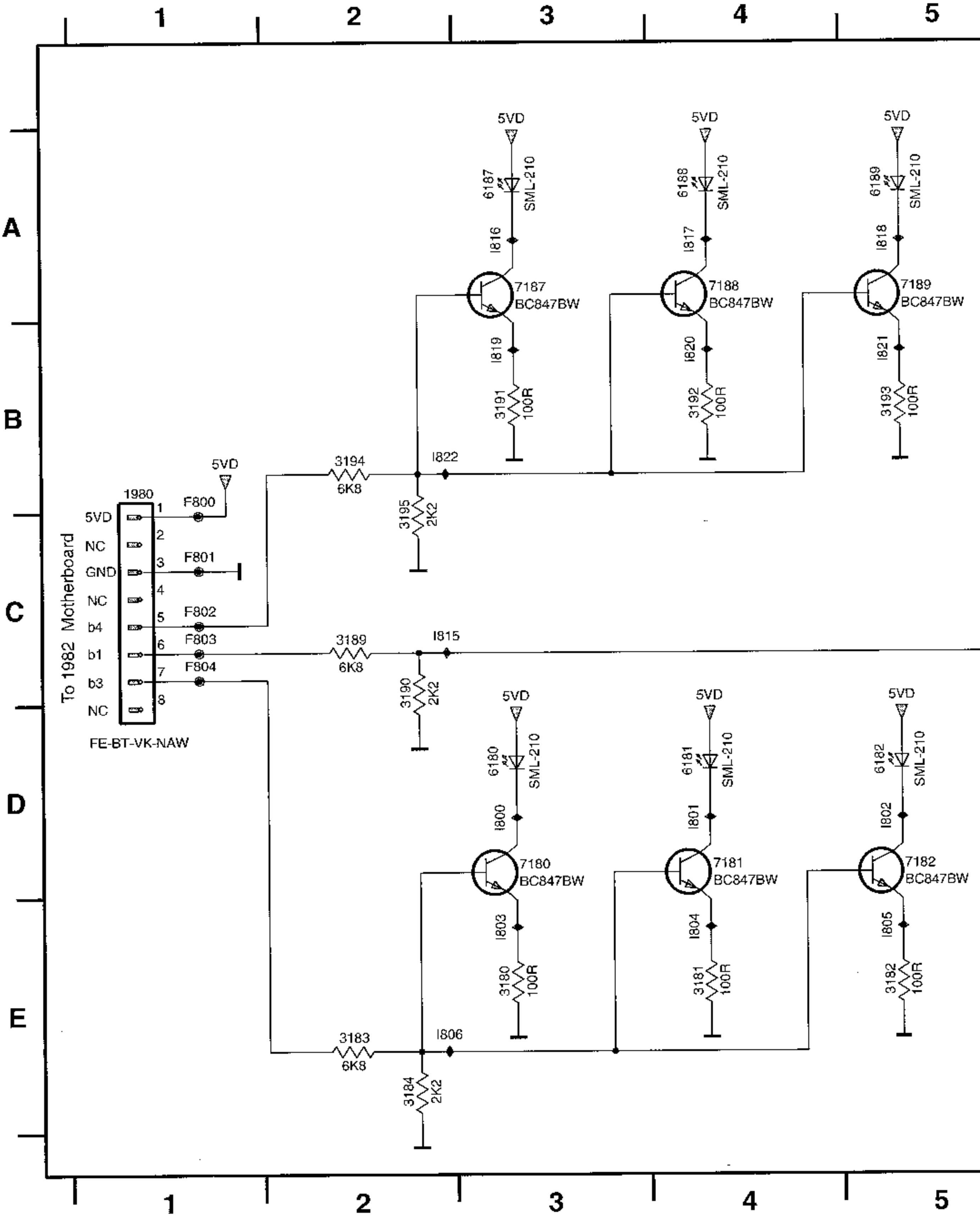
I436 D9
I437 B9

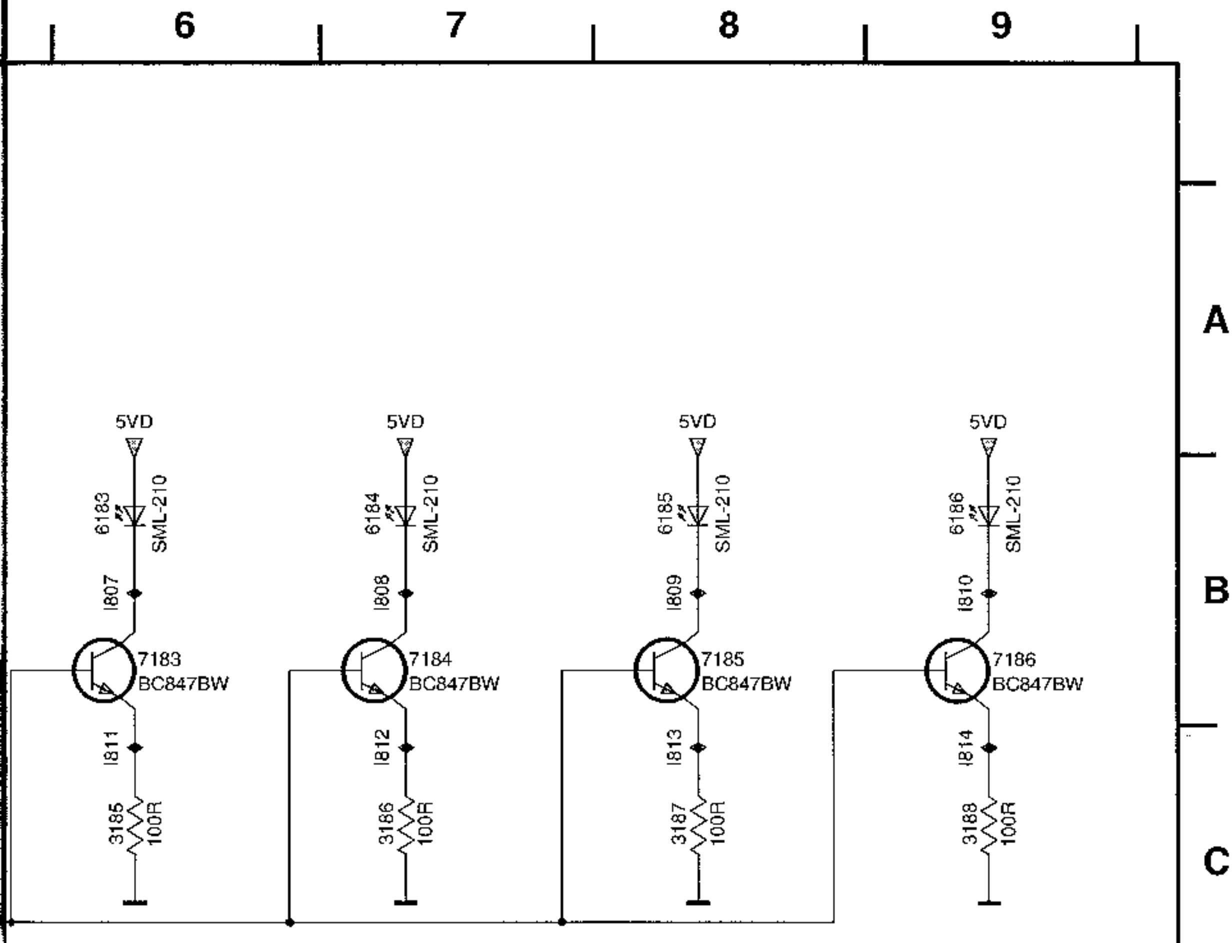

9
10
A
B
C
D
EVQ-11
12K
GND
1948
N.C.
F428
KEY_LED
F429
AN1
GND
GND
5VD
5VD
5VD
TO 1946 ACP35
LTL-1CHEE
7165
BC847BW
100R
GND
AKP35-8927-2
9
10

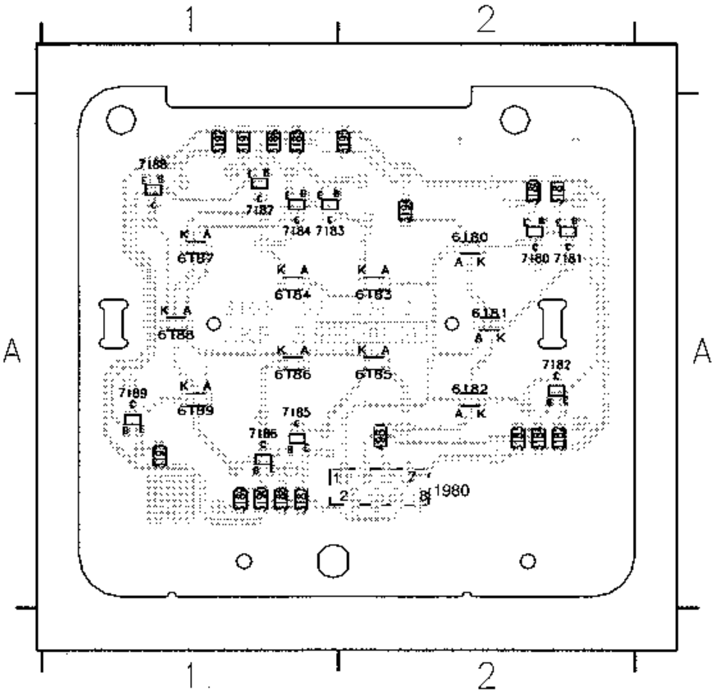

1
2
A
7163
7162
7164
7165
3169

3161
3162
3163
3164
3165
3166
3167
3168
3169
3170
3171
3172
3173
3174
3175
3176
3177
3178
7161
7162
7163
7164
7165

7.28 Illumination print (AKP13)


1
2
3
4
5
A
B
C
D
E
5VD
6187
SML-210
I816
7187
BC847BW
I819
3191
100R
6188
I817
7188
I820
3192
6189
I818
7189
I821
3193
1980
F800
To 1982 Motherboard
5VD
NC
GND
NC
b4
b1
b3
NC
1
2
3
4
5
6
7
8
F801
F802
F803
F804
FE-BT-VK-NAW
3194
6K8
I822
3195
2K2
3189
6K8
I815
3190
2K2
6180
I800
7180
I803
3180
6181
I801
7181
I804
3181
6182
I802
7182
I805
3182
3183
6K8
I806
3184
2K2


6
7
8
9
A
B
C
5VD
6183
SML-210
I807
7183
BC847BW
I811
3185
100R
5VD
6184
SML-210
I808
7184
BC847BW
I812
3186
100R
5VD
6185
SML-210
I809
7185
BC847BW
I813
3187
100R
5VD
6186
SML-210
I810
7186
BC847BW
I814
3188
100R


1
2
A
A
7188
7187
7184
7183
6T87
6T84
6T83
6180
7180
7181
6T88
6181
6T86
6T85
7182
7189
6T89
7185
6182
7186
1980
1
2

3180	A2
3181	A2
3182	A2
3183	A2
3184	A2
3185	A1
3186	A1
3187	A1
3188	A1
3189	A1
3190	A1
3191	A1
3192	A1
3193	A1
3194	A2
3195	A1
4981	A2
6180	A2
6181	A2
6182	A2
6183	A2
6184	A1
6185	A2
6186	A1
6187	A1
6188	A1
6189	A1
7180	A2
7181	A2
7182	A2
7183	A1
7184	A1
7185	A1
7186	A1
7187	A1
7188	A1
7189	A1

AKP13-8926

6 7 8 9

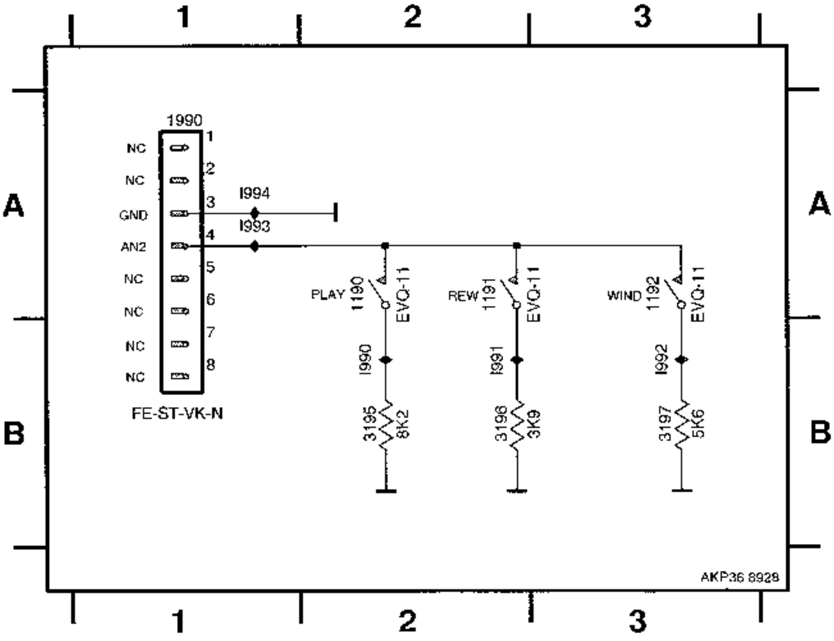
D

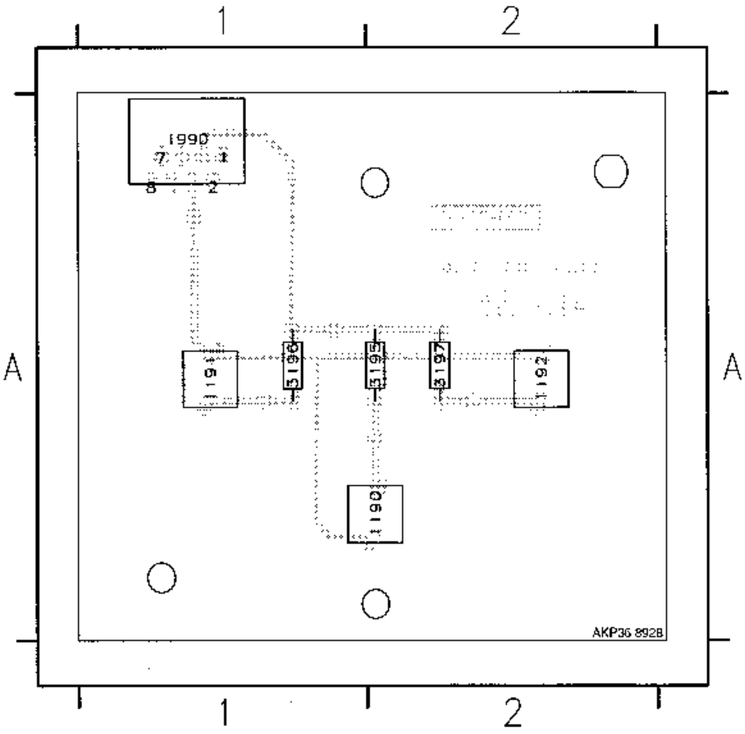
E

1980	B1
3180	E3
3181	E4
3182	E5
3183	E2
3184	E2
3185	C6
3186	C7
3187	C8
3188	C9
3189	C2
3190	C2
3191	B3
3192	B4
3193	B5
3194	B2
3195	C2
6180	D3
6181	D4
6182	D5
6183	B6
6184	B7
6185	B8
6186	B9
6187	A3
6188	A4
6189	A5
7180	D3
7181	D4
7182	D5
7183	B6
7184	B7
7185	B8
7186	B9
7187	A3
7188	A4
7189	A5
F800	B1
F801	C1
F802	C1
F803	C1
F804	C1
I800	D3
I801	D4
I802	D5
I803	E3
I804	E4
I805	E5
I806	E2
I807	B6
I808	B7
I809	B8
I810	B9
I811	C6
I812	C7
I813	C8
I814	C9
I815	C2
I816	A3
I817	A4
I818	A5
I819	B3
I820	B4
I821	B5
I822	B2

7.29 Key print (AKP36)

1190	A2
1191	A2
1192	A3
1990	A1
3195	B2
3196	B2
3197	B3
I990	B2
I991	B2
I992	B3
I993	A1
I994	A1

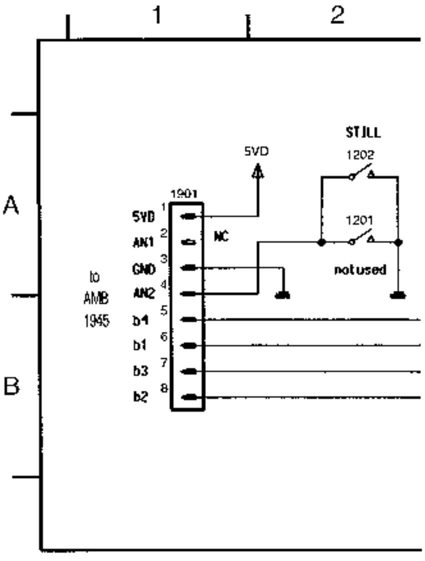

1
2
3
A
B
1990
NC
NC
GND
AN2
NC
NC
NC
NC
1
2
3
4
5
6
7
8
FE-ST-VK-N
I994
I993
PLAY
1190
EVQ-11
REW
1191
EVQ-11
WIND
1192
EVQ-11
I990
I991
I992
3195
8K2
3196
3K9
3197
5K6
AKP36 8928


1
2
A
1990
7
1
8
2
1191
3196
3195
3197
1192
1190
AKP36 8928

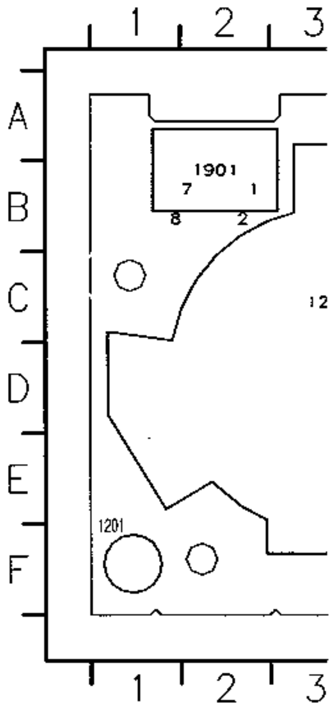
1190	A2
1191	A1
1192	A2
1990	A1
3195	A2
3196	A1
3197	A2

7.30 Shuttle board (ASP10)

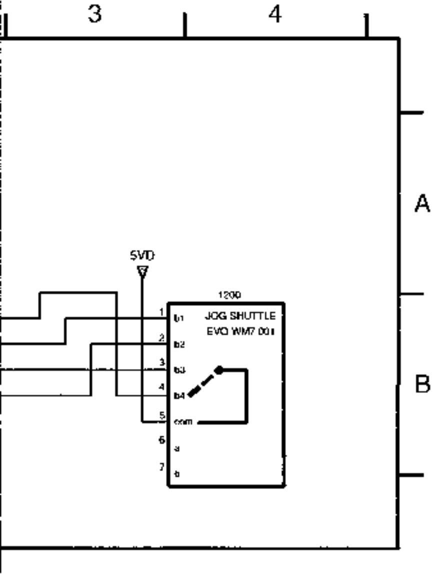
1200	B4
1201	A2
1202	A2
1901	A1

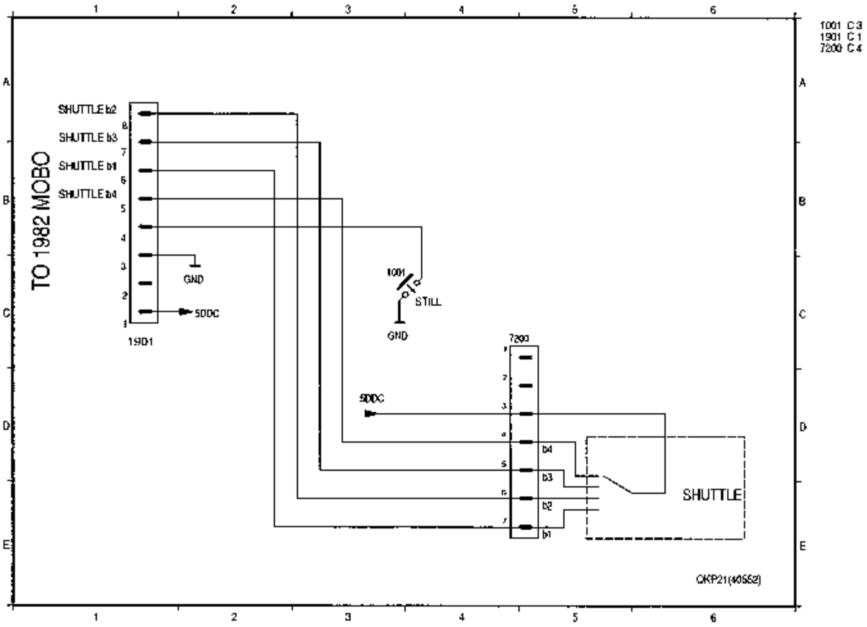

1
2
A
B
5VD
STILL
1202
1201
not used
1901
NC
5VD
AN1
GND
AN2
b4
b1
b3
b2
1
2
3
4
5
6
7
8
to
AMB
1945

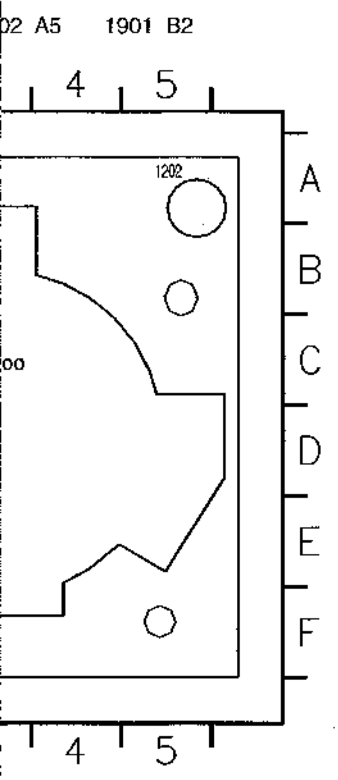
1200 C3 1201 F1 12

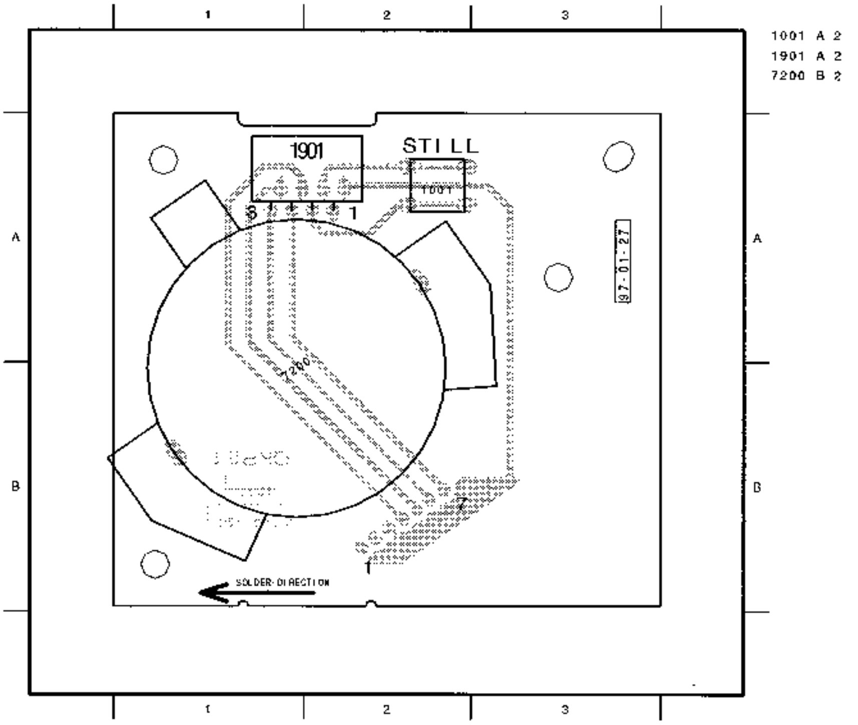

1
2
3
A
B
C
D
E
F
1901
7
1
8
2
12
1201

7.31 Shuttle board (QKP21)

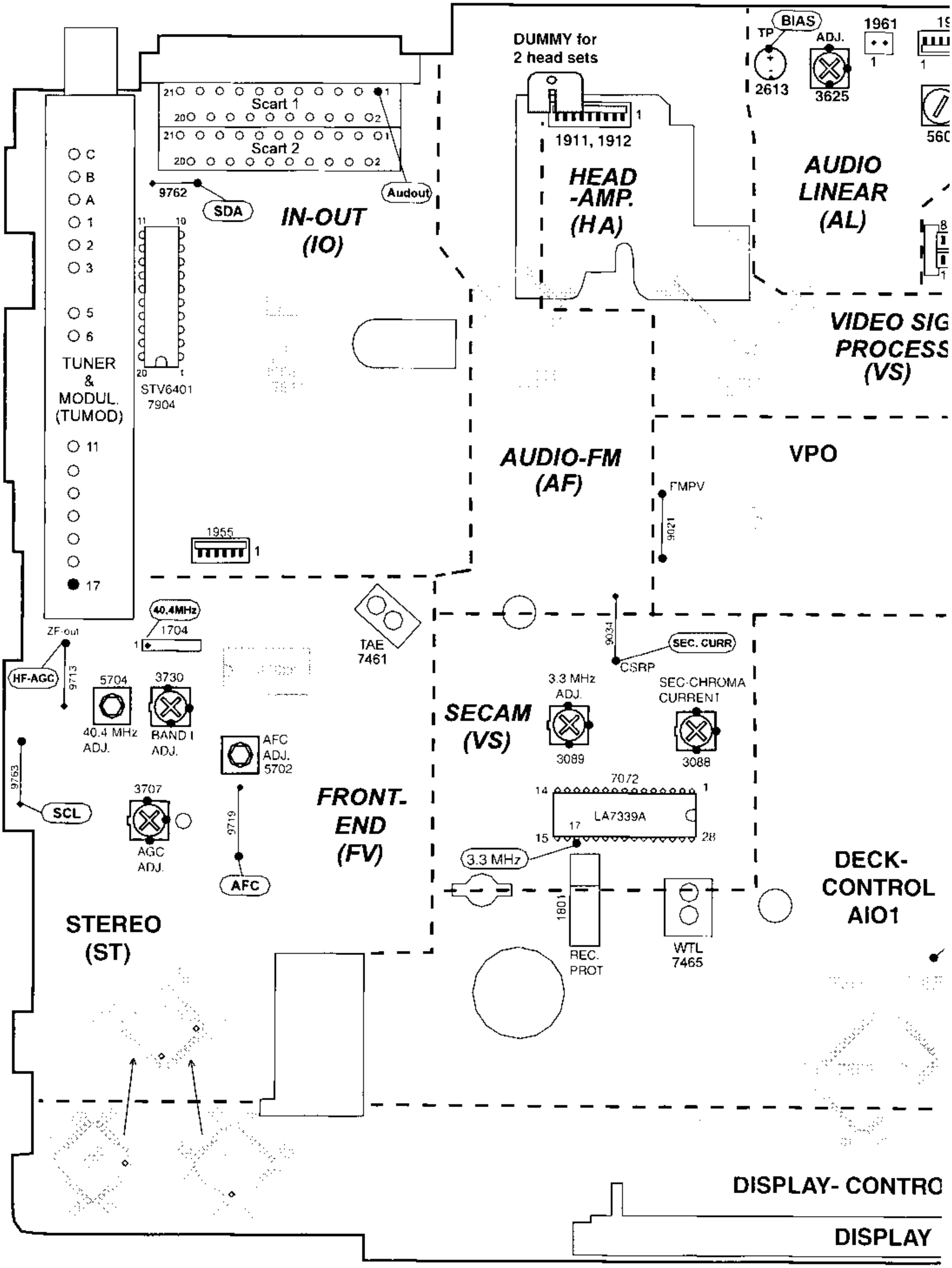

3
4
A
B
5VD
1200
JOG SHUTTLE
EVQ WM7 001
1
2
3
4
5
6
7
b1
b2
b3
b4
com
a
b

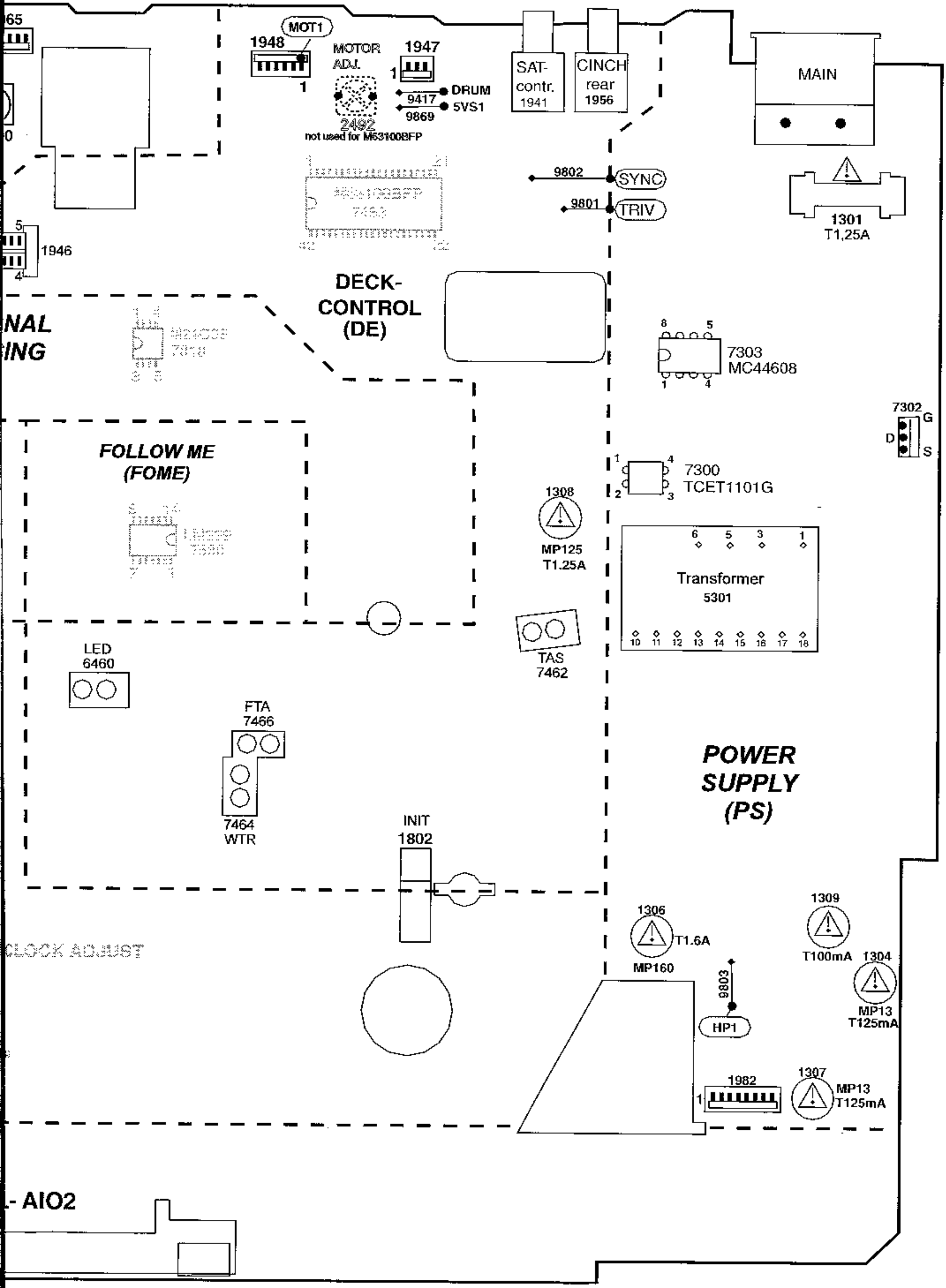

1001 C3
1901 C1
7200 C4
TO 1982 MOBO
SHUTTLE b2
SHUTTLE b3
SHUTTLE b1
SHUTTLE b4
8
7
6
5
4
3
2
1
1901
GND
5DDC
1001
STILL
GND
7200
5DDC
b4
b3
b2
b1
SHUTTLE
QKP21(40552)
1
2
3
4
5
6
A
B
C
D
E


02 A5
1901 B2
4
5
1202
A
B
C
D
E
F
00


1001 A 2
1901 A 2
7200 B 2
1901
STILL
1001
8
1
7200
7
1
97-01-27
SOLDER-DIRECTION
1
2
3
A
B

7.32 Test point overview


Scart 1
21
20
1
2
Scart 2
21
20
1
2
Audout
9762
SDA
IN-OUT
(IO)
11
10
20
1
STV6401
7904
C
B
A
1
2
3
5
6
TUNER
&
MODUL.
(TUMOD)
11
17
1955
1
DUMMY for
2 head sets
1
1911, 1912
HEAD
-AMP.
(HA)
BIAS
TP
ADJ.
2613
3625
1961
1
AUDIO
LINEAR
(AL)
VIDEO SIG
PROCESS
(VS)
AUDIO-FM
(AF)
VPO
FMPV
9021
40.4MHz
1704
1
ZF-out
HF-AGC
9713
5704
40.4 MHz
ADJ.
3730
BAND I
ADJ.
TAE
7461
AFC
ADJ.
5702
9763
SCL
3707
AGC
ADJ.
9719
AFC
FRONT-
END
(FV)
STEREO
(ST)
9034
SEC. CURR
CSRP
3.3 MHz
ADJ.
3089
SEC-CHROMA
CURRENT
3088
SECAM
(VS)
7072
14
1
LA7339A
17
15
28
3.3 MHz
1801
REC.
PROT
WTL
7465
DECK-
CONTROL
AIO1
DISPLAY- CONTRO
DISPLAY


65
1948
MOT1
MOTOR ADJ.
1947
DRUM
5VS1
9417
9869
2492
not used for M63100BFP
SAT-contr. 1941
CINCH rear 1956
MAIN
9802
SYNC
9801
TRIV
1301
T1,25A
1946
DECK-CONTROL (DE)
NAL
ING
7303
MC44608
7302
G
D
S
FOLLOW ME (FOME)
7300
TCET1101G
1308
MP125
T1.25A
Transformer
5301
TAS
7462
LED
6460
FTA
7466
7464
WTR
POWER SUPPLY (PS)
INIT
1802
CLOCK ADJUST
1306
T1.6A
MP160
1309
T100mA
1304
MP13
T125mA
9803
HP1
1982
1307
MP13
T125mA
L- AIO2

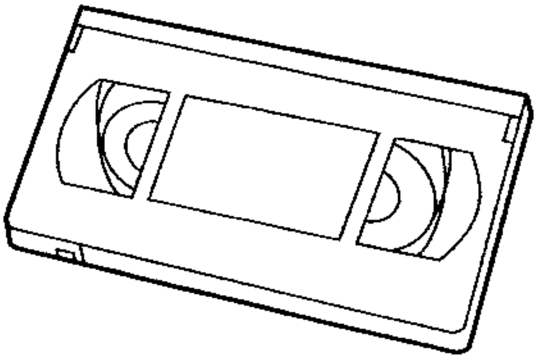
8. Electrical alignments

8.1 Measuring instruments

The following instruments are required to carry out the electrical setting work:

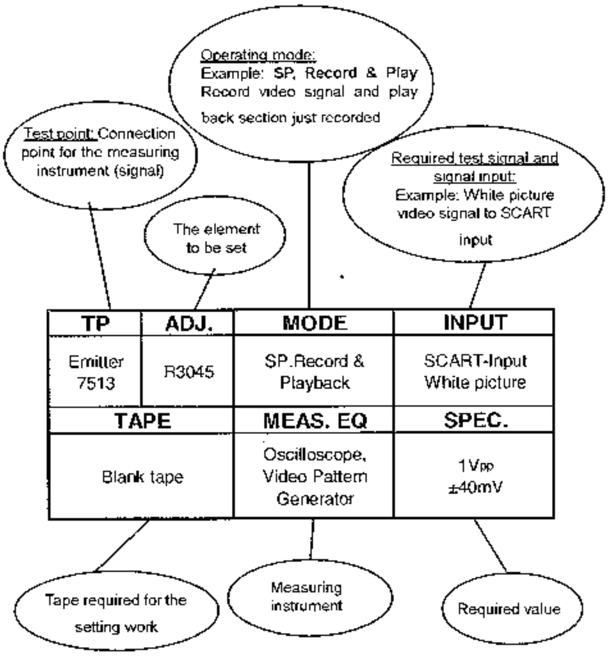
1. Dual trace oscilloscope
Voltage range : 0.001 ~ 50V/Div.
Frequency range : DC ~ 50 MHz
Probe : 10:1; 1:1
2. Digital Multimeter
3. Frequency meter
4. Sine-wave generator : 0 ~ 50MHz
5. Test pattern generator
6. Plastic adjustment tool
7. Isolating transformer (regulating transformer)
8. VHS test cassette 4822 397 30103
SPC test cassette 4822 397 30268

VHS test cassette



Counter Reading Start	0	0040 +8	0310 ±12
Video	Blank	B&W Pattern	Color Bars
Audio	Blank	6kHz (mono)	40Hz, 3kHz, 15kHz (Mono & Stereo)

8.2 Setting instructions


Operating mode:
Example: SP, Record & Play Record video signal and play back section just recorded
Test point: Connection point for the measuring instrument (signal)
Required test signal and signal input:
Example: White picture video signal to SCART input
The element to be set
Tape required for the setting work
Measuring instrument
Required value

TP	ADJ.	MODE	INPUT
Emitter 7513	R3045	SP.Record & Playback	SCART-Input White picture
TAPE		MEAS. EQ	SPEC.
Blank tape		Oscilloscope, Video Pattern Generator	1Vpp ±40mV

8.3 Video signal processing (VS-SEC)

Service tasks after replacement of ICs 7004, 7072:

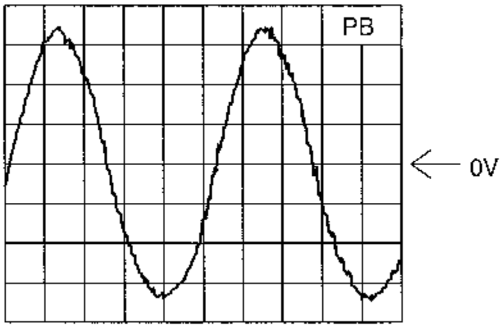
Before commencing adjustment:
Call the service test program and enter Step 10 (Dummy mode). Remove the drive from the motherboard.

8.3.1 3.3 MHz adjustment [3089] (for SECAM)

Purpose:
To adjust the mixing oscillator

Consequences of incorrect settings:
Cross patterns in coloured areas, coloured noise.

TP	ADJ.	MODE	INPUT
IC7072 pin 17	R3089	Dummy mode step 10 playback	1.2 MHz sinus 100mVpp, wire 9021 (FMPV)
TAPE		MEAS. EQ.	SPEC.
		Oscilloscope Video pattern generator Sinus generator	adjust to optimum sinus



A: AC, 50mV/Div, 50ns/Div
IC 7072 Pin 17

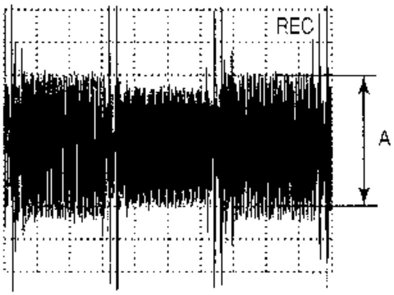
8.3.2 SECAM chrominance record current adjustment [3088]:

Purpose:
To set the optimum record SECAM chroma level.

Symptom, if incorrectly set:
If the record level is too high, beats may appear on the picture. If the level is too low, the colour may be degraded.

TP	ADJ.	MODE	INPUT
CSRP pos.9034	R3088	Dummy mode Record Preset E2	(VIDEO IN E2) Red Picture SECAM 75% Saturation
TAPE		MEAS. EQ.	SPEC.
Blank Tape		Oscilloscope Video Pattern Generator	A=200 ± 15 mV_{pp}

Notes:
With varying frame amplitudes, the setting is made for the greatest amplitude.



A: AC, 50mV/Div, 20us/Div

8.4 Front End (FV)

Service tasks after replacement of IC 7705, coil L5702 and TUMOD:

8.4.1 AFC Adjustment:

Purpose:
Correct adjustment of demodulator AFC - circuit

Symptom, if incorrectly set:
Bad or disturbed TV channel reception.

PAL - AFC adjustment [5702]:

TP	ADJ.	MODE	INPUT
IC 7705 Pin 17 (AFC TP9719)	L5702	E to E	38.9MHz $500mV_{pp}$ at Tuner 1701 Pin 17 (TP9713,ZF-out)
TAPE		MEAS. EQ.	SPEC.
		DC Voltmeter Frequ. Generator	2.5V ±0,2V

SECAM band 1 - AFC adjustment [3730]: (SECAM L / L' only)

Before commencing adjustment:
- Switch to a band 1 SECAM L' preset.
- Is the system switch, in the menu 'MANUAL SEARCHING', not possible, press the right cursor key of the remote in the 'CHANNEL NUMBER' line for a short moment.
- A fine-tuning will be done and the system will switch to the 'AUTO' function.

TP	ADJ.	MODE	INPUT
IC 7705 pin 17 (AFC TP9719)	R3730	E to E, SECAM L' tuned on this preset	33,9MHz $500mV_{pp}$ at Tuner 1701, pin 17 (TP9713, ZF-out)
TAPE		MEAS. EQ.	SPEC.
		DC Voltmeter Sinus Generator	2,5V ±0,2V

8.4.2 HF - AGC adjustment [3707]:

Service tasks after replacement of ICs 7705, or TUMOD:

Purpose:
Set amplifier control.

Symptom, if incorrectly set:
Picture jitter if input level is too low and picture distortion if input level is too high.

TP	ADJ.	MODE	INPUT
Tuner 1701 Pin 17 (TP9713, ZF-out)	R3707	Set tuned to channel 27	4,5mV(74dBµV) on aerial input PAL white picture, audio IF on, no modulation
TAPE		MEAS. EQ.	SPEC.
		Oscilloscope Video Pattern Generator	$550mV_{pp}$ +/-50mV (use a 10:1 probe)

8.4.3 Attenuating the 40.4 MHz [5704]: (SECAM only)

Service tasks after replacement of coil 5704:

Purpose:
To attenuate the band I carrier rests.

Symptom, if incorrectly set:
Bad picture quality when the filter attenuates the picture carrier (38.9MHz).

TP	ADJ.	MODE	INPUT
OFW 1704 Pin 1	L5704	E to E	40.4 MHz, $300mV_{rms}$ at Tuner 1701 Pin 17 (TP9713,ZF-out)
TAPE		MEAS. EQ.	SPEC.
		Oscilloscope, Sinus Generator, Counter	adjust minimum amplitude

If the adjustment is correct the signal at pin 1 of SFW [1704] must be smaller than the input signal amplitude by at least 5 dB.

8.5 Deck electronics (DE)

Service tasks after replacement of IC 7463:

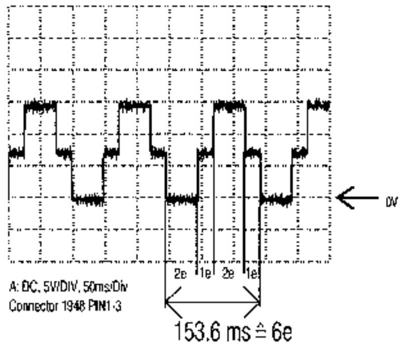
8.5.1 Motor frequency - adjustment [2492] (OPTION):

Purpose:
To adjust the working frequency of the head motor driver (not necessary for M63100 BFP).

Result of an incorrect adjustment:
Head motor doesn't start correctly.

Before commencing adjustment:
- bring VCR in to EJECT state
- disconnect set from main power source
- remove cable 8004 from connector 1948
- connect test point DRUM [9417] with 5VS1 [9869] (wires on component side)
- reconnect to main power source

TP	ADJ.	MODE	INPUT
Connector 1948 Pin 1	C2492	EJECT	
TAPE		MEAS. EQ.	SPEC.
		Oscilloscope, Counter	153,6 ms ±1,5ms see Diagram



8.6 Servo System (AIO1)

Service tasks after replacement of the head drum SYCA 7004-B or EEPROM.

8.6.1 Setting the gap position (GAP):

Purpose:
To determine the correct head switching point during playback.
Symptom if incorrectly set:
Head switching fault and/or vertical picture flickers.

- Enter the service test program and, whilst step display is flashing, enter the step number 51, using the numerical keys.
- Insert a test cassette (e.g. 4822 397 30103) with the standard video signal in the VCR.
- By pressing the SELECT key whilst step 51 is flashing, the automatic adjustment is triggered and stored in the EEPROM .

TP	ADJ.	MODE	INPUT
		Stop Service Mode	
TAPE		MEAS. EQ.	SPEC.
VHS Alignment Tape			Call up Step 51 of Service Mode

After a correct adjustment, the display shows 1;0 when incorrect. In case of unsuccessful tuning the VCR ejects the cassette. To leave the step, press SELECT.

Causes of incorrect adjustment :
Incorrect standard video signal.
Scanner fault.
Microprocessor fault.

8.6.2 "Studio Picture control" adjustment (SPC):

Purpose:
Adjustment of the reference level for the SPC.
Symptom if incorrectly set:
The picture is played back at a lower resolution than would be possible.

TP	ADJ.	MODE	INPUT
		Stop Service Mode	RF or A1- input, black picture without BURST
TAPE		MEAS. EQ.	SPEC.
SPC Alignment Tape			Call up Step 52 of Service Mode

- Video signal via Scart or aerial
- Enter the service test program and, whilst the step is flashing, input the step number 52, using the numerical keys.
- Insert SPC Alignment Tape 4822 397 30268.
- By pressing the SELECT key whilst step 52 is flashing, the recorder makes a recording in SP mode (approx. 10 sec.) and in LP mode (approx. 10 sec.), rewinds and carries out a playback with automatic adjustment.
- After a correct adjustment the display shows 1, and 0 for incorrect adjustments. In case of unsuccessful tuning the VCR ejects the cassette.

To leave the step press SELECT.

8.7 Audio linear - (AL)

Service tasks after replacement of coil L5600, IC7004 or the audio heads:

8.7.1 Adjusting the erasing frequency [5600]:

Purpose:
To set the correct recording erasing frequency.
Symptom, if incorrectly set:
Erasing frequency or its harmonics cause audio faults.

TP	ADJ.	MODE	INPUT
connector 1965 pin 5	L5600	Record E1	PAL white picture, with sound on E1 (1kHz or 10kHz)
TAPE		MEAS. EQ.	SPEC.
Blank Tape		Frequency Counter	70kHz ±10kHz

8.7.2 Adjustment of bias current [3625]:

Purpose:
To set the optimum record bias current.
Symptom, if incorrectly set:
If the audio level is too high, the higher frequencies of the linear sound are too low.
If the level is too low, the higher frequencies are too strong and sound distortions increase.

TP	ADJ.	MODE	INPUT
C2613 (TP BIAS)	R3625	Record E1	PAL white picture, with sound on E1 (1kHz or 10kHz)
TAPE		MEAS. EQ.	SPEC.
Blank Tape		AC Millivoltmeter, Oszilloskop, Video Pattern Generator	$14V_{RMS} \pm 1V_{RMS}$ (70kHz)

Checking the 'bias' adjustment:
Apply a sine-wave signal with an amplitude of 50mVeff to the SCART audio input. Record the 1kHz signal and 10kHz signal for 30 seconds each. Play back the recording and check that the amplitude difference is in the ±3dB range. If this is not the case, correct the value for the magnetic biasing current. If the treble is too low, the bias current should be reduced slightly. If the distortion is too great, the bias current should be increased slightly.
(approximate value: +1V = -1dB Treble).

8.7.3 Adjustment of the audio linear playback amplitude [IIC-bus]:

Purpose:
To set audio part amplification LA71595 [7004-A]
Symptom, if incorrectly set:
Playback sounds too low or too loud.

Enter the service test program and, whilst step display is flashing, enter the step number 62, using the numerical keys.

TP	ADJ.	MODE	INPUT
Pin 1 of Scart 1 (Audout)	refer to description	SP Self-recording and Playback, Service mode call up Step 62	(Video white picture) Audio in Scart 1, $700mV_{RMS}$, 1kHz
TAPE		MEAS. EQ.	SPEC.
Blank Tape		AC Millivoltmeter, Video Pattern, Frequency Generator	$500mV_{RMS}$ ±50mV

By pressing the SELECT button whilst step 62 is flashing, the output select is switched to Mono and the display shows, for instance:

- Make a recording of the audio signal on E1.
- Connect the millivoltmeter to Scart1 Pin1(Audio out) and play the recording back.
- The level on Scart 1, Pin1 (Audio out) can be adjusted to the set value by pressing the UP (value increases) or DOWN keys (value decreases).
- (The amplitude changes by 1 dB each time the key is pressed).
- The range is shown in the display by the numbers 0...31.
- The value is automatically stored in the EE-PROM each time the button is pressed.

8.8 Display Control (AIO2)

Service tasks after replacement of the clock quartz [1170] or the EEPROM:

8.8.1 Clock frequency output

Purpose:
Setting the exact clock function.
Symptom, if incorrectly set:
The clock is too fast or too slow.

Remove the Motherboard from the frame and bring it into the service position.
Enter the service test program and, whilst step display is flashing, enter the **step number 99**, using the numerical keys.

TP	ADJ.	MODE	INPUT
7899-A pin 71 CLOCK ADJ.		Stop Service Mode call up Step 99	
TAPE		MEAS. EQ.	SPEC.
		Frequency counter with 6 digits	refer to description below

After entering with SELECT, the display is switched off and the watch symbol is flashing, no further function can be carried out. At the CLOCK ADJUST measuring point [7899-A, pin 71], the uncorrected clock frequency of approx. 8192 Hz is always output.
Measure the output frequency with the calibrated counter (minimum resolution of 6 digits) and note down the value (f_{mess}).

Determining the deviation (in ppm):

f_{mess}..... measured frequency
f_{nom}........target frequency (8192,00 Hz)
Deviation = 1x106 x (f_{mess} - f_{nom}) / f_{nom}

Determining the correction value for Step 53:
Correction value = Deviation / 0.763 + 128 (round off to whole number)

The calculated **correction value** must be between 0 and 255 (change quartz otherwise), and must be entered in Step 53 and saved.
This step can either be exited by performing a main power source reset, after which the service program must be entered again **or by pressing any key on the set**, before step 53 can be entered.

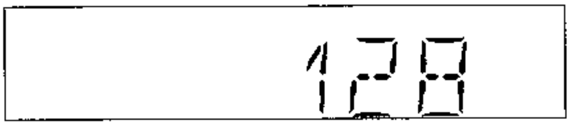
Example:
f_{mess}=8191.97Hz f_{nom} =8192.00Hz

Deviation = 1×10^6 x (8191.97 - 8192.00) / 8192.00 = **-3.662**
Correction value = -3.662 / 0.763 + 128 = 123.20 = **123**

8.8.2 Inputing the clock correction

Before carrying out step 53, the correction value must be established in step 99.

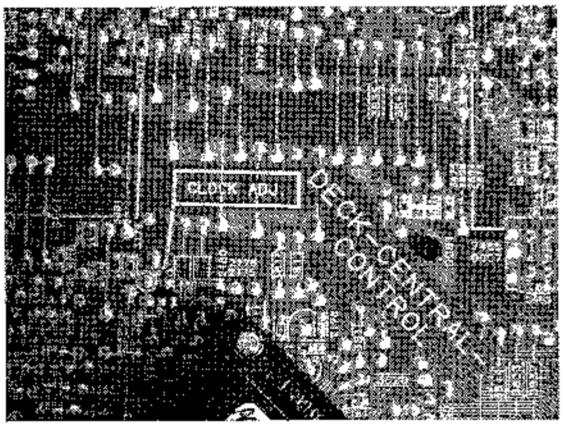
By pressing the SELECT key whilst **step 53** is flashing, the display shows, for instance (128 is the default value of an empty EEPROM):



Using the numerical keys of the remote control, the established correction value from **Step 99** is entered as a 3-digit number (value must be between 0 and 255).

After pressing the OK key on the remote control, the entered code is stored, the display shows OK for approx. 3 seconds and then the stored value in decimal format.

In case of an invalid entry (value >255), the activation of the OK key causes the content of the last stored value to be displayed and OK does not appear in the display.
To leave the step press Select.



Adjustment table of the clock frequency:
Measured frequency in Hertz:

measured clock frequency pos. 7899-A pin 71 [Hz]	corrected value for Step 53 input	Time deviation minutes / year
8192,00	**128**	0,0
8191,98	**125**	-1,2
8191,96	**122**	-2,4
8191,94	**118**	-3,7
8191,92	**115**	-4,9
8191,90	**112**	-6,1
8191,88	**109**	-7,3
8191,86	**106**	-8,5
8191,84	**102**	-9,8
8191,82	**99**	-11,0
8191,80	**96**	-12,2
8191,78	**93**	-13,4
8191,76	**90**	-14,6
8191,74	**86**	-15,9
8191,72	**83**	-17,1
8191,70	**80**	-18,3
8191,68	**77**	-19,5
8191,66	**74**	-20,8
8191,64	**70**	-22,0
8191,62	**67**	-23,2
8191,60	**64**	-24,4
8191,58	**61**	-25,6
8191,56	**58**	-26,9
8191,54	**54**	-28,1
8191,52	**51**	-29,3
8191,50	**48**	-30,5
8191,48	**45**	-31,7
8191,46	**42**	-33,0
8191,44	**38**	-34,2
8191,42	**35**	-35,4
8191,40	**32**	-36,6
8191,38	**29**	-37,8
8191,36	**26**	-39,1
8191,34	**22**	-40,3
8191,32	**19**	-41,5
8191,30	**16**	-42,7
8191,28	**13**	-43,9
8191,26	**10**	-45,2
8191,24	**6**	-46,4
8191,22	**3**	-47,6
8191,20	**0**	-48,8

measured clock frequency pos. 7899-A pin 71 [Hz]	corrected value for Step 53 input	Time deviation minutes / year
8192,00	**128**	0,0
8192,02	**131**	1,2
8192,04	**134**	2,4
8192,06	**138**	3,7
8192,08	**141**	4,9
8192,10	**144**	6,1
8192,12	**147**	7,3
8192,14	**150**	8,5
8192,16	**154**	9,8
8192,18	**157**	11,0
8192,20	**160**	12,2
8192,22	**163**	13,4
8192,24	**166**	14,6
8192,26	**170**	15,9
8192,28	**173**	17,1
8192,30	**176**	18,3
8192,32	**179**	19,5
8192,34	**182**	20,8
8192,36	**186**	22,0
8192,38	**189**	23,2
8192,40	**192**	24,4
8192,42	**195**	25,6
8192,44	**198**	26,9
8192,46	**202**	28,1
8192,48	**205**	29,3
8192,50	**208**	30,5
8192,52	**211**	31,7
8192,54	**214**	33,0
8192,56	**218**	34,2
8192,58	**221**	35,4
8192,60	**224**	36,6
8192,62	**227**	37,8
8192,64	**230**	39,1
8192,66	**234**	40,3
8192,68	**237**	41,5
8192,70	**240**	42,7
8192,72	**243**	43,9
8192,74	**246**	45,2
8192,76	**250**	46,4
8192,78	**253**	47,6

9. Circuit descriptions and List of abbreviations

9.1 Switched-mode power supply PS (PS Part)

9.1.1 Technical data:

Mains voltage	:	195-264 Vrms
Maximum output	:	15W / 40W (continuous / maximum output)
Operating frequency	:	40 kHz
Efficiency	:	approx. 75 % at maximum output

Six different direct voltages are supplied on the power supply outputs.

9.1.2 Functional principle:

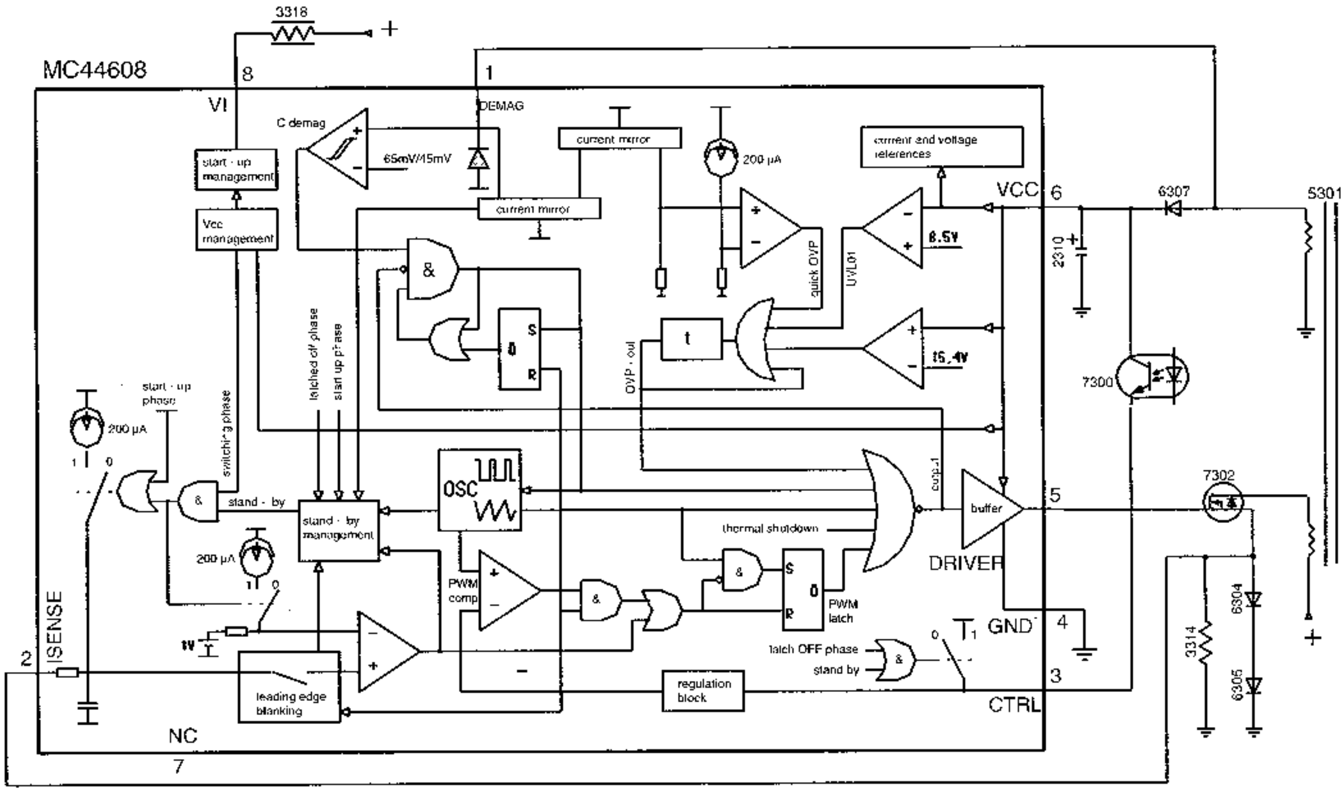
This power supply functions in a similar way to a blocking oscillator. In the supply voltage part [1300 to 2318], the mains voltage is rectified and buffered in the capacitor [2318]. From this direct voltage [2318] energy is transferred into the transformer [5301, pins 1-3] during the conductive phase of the switching transistor [7302] and is stored there as magnetic energy. This energy is passed to the secondary outputs on the power supply in the in the blocking phase of the switching transistor [7302]. With the switch-on time of the switching transistor [7302], the energy transferred in every cycle is regulated in such a way that the output voltages remain constant regardless of changes in the load or input voltages. The power transistor is activated using the integrated switch [7303] (see figure 9-1).

9.1.3 Supply voltage part

The supply voltage part extends from the mains socket [1300] to the capacitor [2318]. Using the diodes [6310, 6311, 6312 and 6313] the a.c. supply voltage is rectified and buffered using the capacitor [2318]. The line reactor [5305] and capacitor [2316] create a filter to keep interference arising in the power supply away from the mains. Components [1302], [3326] and [3323] protect the power supply against short-term overvoltages in the mains, e.g. caused by indirect effects from lighting.

9.1.4 Start-up with Mains-on:

Following connection to the mains, the capacitor [2310] is loaded via the start-up resistor [3318] and a current source between pin 8 and pin 6 on the IC [7303]. Once the voltage on [2310] and therefore the supply voltage Vcc on the IC [7303] has reached approx. 13V, the IC starts up and issues pulses to its output on pin 5. These pulses are used to control the gate on the power transistor [7302] (see figure 9-2). The frequency has a fixed setting in the IC (approx. 40 kHz). The current input on the IC is approx. 5 mA in normal mode.
If Vcc drops to below approx. 10V (e.g. with power limitation) or if Vcc exceeds around 15V (interruption of the control loop), the output on the IC [7303, pin 5] is blocked. All output voltages on the power supply, and therefore also Vcc, decrease. Once Vcc has dropped to below approx. 6.5V, a new start-up cycle begins. (See also "Overload, Power Limitation, Burst Mode" section)


3318
+
MC44608
8
VI
1
DEMAG
C demag
65mV/45mV
current mirror
current mirror
200 µA
current and voltage references
VCC
6
6307
5301
2310
6.5V
quick OVP
UVLO1
start - up management
Vcc management
&
S
Q
R
t
OVP - out
15.4V
7300
latched off phase
start up phase
switching phase
start - up phase
200 µA
1
0
&
stand - by
stand - by management
OSC
curr_t
buffer
5
7302
DRIVER
thermal shutdown
200 µA
1
0
PWM comp
&
&
S
Q
R
PWM latch
1V
latch OFF phase
stand by
&
0
T1
GND
4
+
ISENSE
2
leading edge blanking
regulation block
3
CTRL
3314
6304
6305
NC
7

9.1.5 Normal mode:

With the power supply in normal mode, the periodic sequences in the circuit are divided primarily into the conductive and blocking phase of the switching transistor [7302]. During the **conductive phase** of the switching transistor [7302], current flows from the rectified mains voltage to the capacitor [2318] through the primary coil on the transformer [5301, pins 1-3], the transistor [7302] and resistors [3314, 3331] to earth (see figure 9-1). The positive voltage on pin 1 of the transformer [5301] can be assumed to be constant for a switching cycle. The current in the primary coil on the transformer [5301] increases linearly in the pattern of U=L*di/dt. A magnetic field representing a certain volume of the primary current is formed inside the transformer. In this phase, the voltages on the secondary coils are polarised in such a way that the diodes [6300, 6301, 6306, 6308 and 6309] block. From the controller on [7301], a current is supplied to the CTRL input on the IC [pin 3, 7303] via optocoupler [7300]. Once the switch-on time for the switching transistor [7302] has been reached, which corresponds to the current supplied on the CTRL input, the switching transistor is switched off.

Once the switching transs been switched off, the **blocking phase** begins. No more energy will be transferred into the transformer. The inductivity of the transformer will still attempt to maintain the current which has flowed through it (U=L*di/dt) at a constant level. As the primary current circuit is interrupted by the shut-off switching transistor [7302], the current will flow through the secondary coils.
The polarity of the voltages on the transformer is reversed, which means that the diodes [6300, 6301, 6306, 6308 and 6309] become conductive and current flows into the capacitors [2301, 2305, 2309, 2311 and 2312] and the load. This current is also ramp-shaped (di/dt negative, therefore decreasing).
The control adjustment for the switched-mode power supply is made by changing the conductive phase of the switching transistor (see figure 9-2), so that either more or less energy is transferred from the rectified mains voltage to [2318] in the transformer. The control information is provided by the control element [7301]. This element compares the 5V output voltage via the voltage dividers [3300, 3306, 3336] with an internal 2.5V reference voltage. The output voltage from [7301] passes via an optocoupler [7300] (for the metallic isolation of the primary and secondary parts) as the current value to pin 3 on the IC [7303]. The switch-on time for the switching transistor [7302] is inversely proportional to the value of this current.

9.1.6 Overload, power limitation, burst mode:

With an increasing load on one or more power supply outputs, the switch-on time for the power transistor [7302] also increases, and thus also the peak value of the delta-shaped current through this power transistor. The equivalent voltage circuit for this current profile is passed from resistors [3314] and [3331] via [3312] and [3347] to pin 2 on the IC [7305]. If the voltage on pin 2 reaches 1V in one switching cycle, the conductive phase of the switching transistor is ended immediately. This check is made in each individual switching cycle. This process ensures that no more than approx. 48W can be taken out of the mains (= **power limitation**).
If the power supply reaches the power limit, the output voltages and the supply voltage Vcc on pin 6 of the IC [7303] will be reduced following further loading. If Vcc is less than approx. 10V at any point during this process, the output on the IC [7303, pin 5] is blocked. All output voltages and Vcc are reduced. Once Vcc has dropped to below approx. 6.5V, a new start-up cycle begins. If the overload status or short-circuit remains, the power limitation will be activated immediately and the voltages will continue to be reduced, followed by another start-up attempt (Burst Mode). The amount of power taken up from the mains in burst mode is low.

9.1.7 Standby mode:

In the 'Standby' operating mode on the device, the 'STBY' control line is used to shut off the output voltages 14AL, 5VA and 5VD on the power supply to minimise the amount of power taken up from the mains. The supply to the display heating can also be switched off using the 'I1WSTBY' control line. The power supply itself will continue to function continuously in the 'Standby' operating mode with a switching frequency of 40kHz.

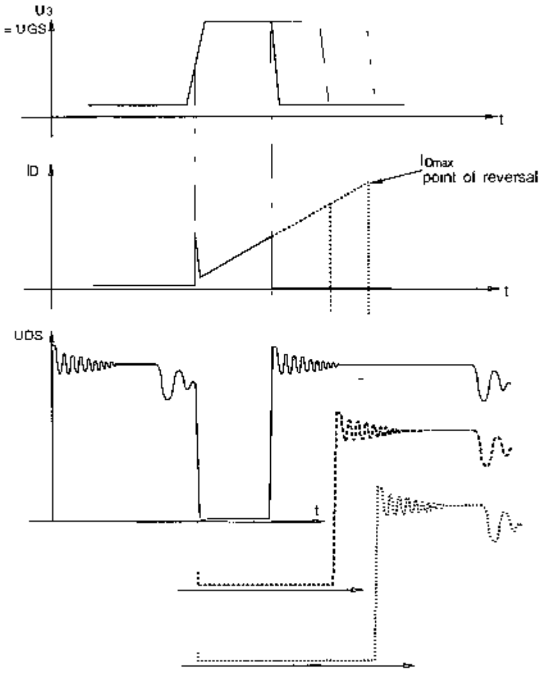


Figure 9-2

9.2 Operating unit DC (DC part)

The microcontroller TMP93CT76F [7899-A] is a 16 bit microcontroller fitted with 128Kb ROM and 2.5Kb RAM.
It is the core element of the operating unit, fulfilling the following tasks with the respective functional groups:

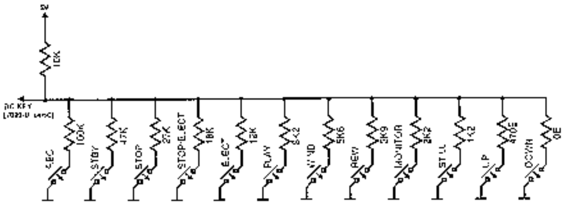
- Integrated VFD driver
- Timer
- Evaluation of the keyboard matrix
- Decoding the remote control commands from the infra-red receiver pos. 6170
- Activation of the display
- Back-up mode

In normal operation, the P is operated in dual-clock mode, i.e. both quartzes [1170, 1171] oscillate. The time is derived from the slow quartz [1170] (32.768 kHz), and the fast quartz [1171] (16MHz) is used to generate the system clock frequency.
In case of a mains failure (back-up mode) the P is not reset, but instead the mains failure is registered by the IPOR interrupt 3 [7899-B] (pin 67) and the P is moved into "Sleep mode" (low power consumption). The 16MHz quartz is turned off and the 32kHz quartz is then used as the clock and system clock frequency. The operating voltage for the AIO is buffered by a back-up cell [pos. 2174, 2172]. A diode [6171] prevents this gold capacity from discharging.

9.2.1 Evaluation of the keyboard matrix

There are 12 different keys. Each key function is assigned a fixed voltage value. This value is decoded using an analogue/digital (A/D) port (7899-B, pin 56). Each mechanical key position on the printed board can adopt any key function via a coding resistor. Pressing keys simultaneously may lead to undesired functions!

Schematic:


5V
10K
µC KEY
[7899-B pin 56]
100K
47K
27K
18K
12K
8K2
5K6
3K9
2K2
1K2
470E
0E
REC
STBY
STOP
STOP-EJECT
EJECT
PLAY
WIND
REW
MONITOR
STILL
LP
DOWN

9.2.2 IR receiver and signal evaluation

The IR receiver [6170] includes a selective, controlled amplifier in addition to a photo-diode. The photo-diode changes the received transmission (approx. 940nm) in electrical pulses, which are then amplified and demodulated. On the output of the IR receiver [7220] a level lift 0V/5V pulse sequence, which corresponds to the envelope curve of the received IR remote control command, can be measured. This pulse sequence is input into the controller for further signal evaluation via input IRR [7899-B, pin 46].

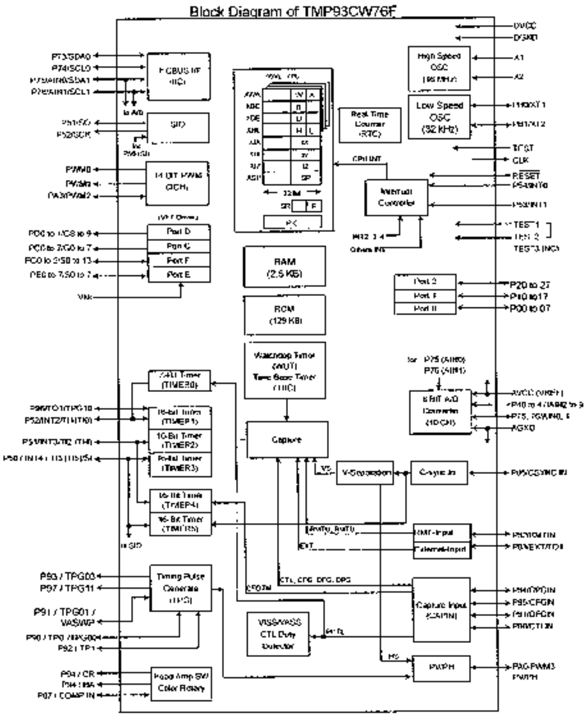
9.2.3 Activation and function of the VFD display

In principle, the VFD display [7170] is a tube triode in which the heating filaments in the tube serve as cathodes (F+,F-). The 7 grids (G1 - G7) are activated via PC2 - PC7, PD0 on the controller, and the 16 anodes (P1 - P16) are controlled via ports PE0 - PE7, PF0 - PF7, PC0, PC1 on the controller, each with a positive potential compared to the cathode.
The grids and anodes (digits and symbols to be displayed) are activated in the time-multiplex procedure, voltage lift 5V/ -18V. A dimmer function is generated using pulse-width modulation of the grid control signals. At maximum display brightness, the pulse width for each grid is 2.16 ms. It can be reduced, controlled using software, which reduces the visual brightness of the VFD display accordingly.
A digit or symbol is only illuminated if the corresponding anode and the surrounding grid are switched simultaneously to 5V for a certain time within a scanning period. The electrons emitted from the cathode are accelerated by the positively charged grid and hit the luminous layer of the anode which is also positively charged.
During the remainder of the scanning period, the corresponding grid and parts of the anode are at -18V, due to the internal pull-down resistors in the controller. This potential is still lower than the average cathode potential of approx. -15V, prevents the acceleration of electrons, thus causing the relevant grid and anode segments to go dark.
The heating direct voltage of the display (U = 3.5V) is supplied from the power supply via lines HELO or HEHI to pins F+ and F- to the VFD display. Resistors [3070] and [3071] restrict F- to approx. -15V.

9.3 Central Control AIO (AIO part)

The microcontroller (µC) TMP93CT76F [7899-B] includes the following functions:

- PWM outputs
- A/D converters
- Composite sync input
- Special servo inputs for VCR functions
- I^2C-BUS interface
- Shuttle evaluation


Block Diagram of TMP93CW76F
DVCC
DGND
High Speed OSC
X1
X2
Low Speed OSC (32 kHz)
Real Time Counter (RTC)
P73/SDA0
P74/SCL0
P75/AIN0/SDA1
P76/AIN1/SCL1
I²CBUS I/F (IIC)
to A/D
P51/SO
P52/SCK
SIO
PWM0
14 BIT PWM (3CH)
VFT Driver
Port D
Port C
Port F
Port E
RAM (2.5 KB)
ROM (129 KB)
CPUINT
Interrupt Controller
TEST
CLK
RESET
TEST1
TEST2
TEST3 (NC)
Others INT
Port 2
Port 1
Port 0
P20 to 27
P10 to 17
P00 to 07
Watchdog Timer (WDT)
Time Base Timer (TBC)
P75 (AIN0)
P76 (AIN1)
8 BIT A/D Converter (10CH)
AVCC (VREF)
AGND
22-Bit Timer (TIMER0)
16-Bit Timer (TIMER1)
16-Bit Timer (TIMER2)
8-Bit Timer (TIMER3)
16-Bit Timer (TIMER4)
16-Bit Timer (TIMER5)
Capture
VS
V-Separation
C-sync In
to SIO
CMT-Input
External-Input
EXT
CTL, CFG, DFG, DPG
CFG7M
Timing Pulse Generate (TPG)
P93 / TPG03
P97 / TPG11
P91 / TPG01 / VASWP
P92 / TP1
VISS/VASS CTL Duty Detector
Capture Input (CAPIN)
P94/DPGIN
P95/CFGIN
P96/DFGIN
HS
PWPH
P94 / CR
P07 / COMP IN
Head Amp SW Color Rotary

9.3.1 Analogue interface to the C:

The following analogue levels are supplied to the µ C's internal analogue/digital (A/D) converter:

• TAE/TAS	Tape End / Tape Start Detection
• TRIV	Tracking Information Video
• TRIA	Tracking Information Audio
• AGC	Automatic Gain Control
• AFC	Automatic Frequency Control
• 8SC1/2 voltage	Pin 8 Scart1 or Scart2 switching
• Key-in	Keypad evaluation

9.3.2 Tape end - LED control :

The LED current is switched using transistor [7804]. The ON time is approx. 1 msec and the OFF time approx. 12 msec during playback and 1msec to 5.5msec during the winding functions.
The LED current is typically 150 mA. In order to prevent interference from the relatively high pulsed current 'spreading' through the entire unit, the LED is fed from the 14VM1, and filtered by 2 resistors [3800, 3805] with 10R each and a 220µF electrolytic capacitor [2803].

9.3.3 CMT detection (video detection with CSYNC)

This has been extended due to identification problems with weak transmission signals and video signals not conforming to the STANDARD (common channel interference). The CSYNC line is supplied to the µP [7899-B] on pin 50. A hardware integration [7807,7808,7809] of the video pulse compensates the interference generated by the common channels and weak signals.

9.3.4 EE-PROM

The EE-PROM [7818] is a non-volatile memory which can be erased and written to electrically. (Data remains even if the operating voltage fails). Data specific to the device such as the X distance, head changeover position, preset stations, optional bytes etc. is stored in the EE-PROM [7818]. The data is accessed by the µP via the I^2C bus.

9.3.5 Easy link (P50)

For the communication between the TV set, video recorder and the peripheral devices, a bi-directional single-wire bus is used, which runs via pin 10 to scart socket 1.
The output signal is generated on pin 84 of the µC [7899-B], pin 68 is the signal input.

9.3.6 Shuttle

The shuttle is connected to the motherboard on plug pos.1982. It is a binary coded rotary switch with a rotation angle of +/- 70 degrees and 16 switch positions. These are input and evaluated via four lines (shuttle b1 - shuttle b4) to the input ports P24 - P27 [7899B pins 2-5].

9.3.7 Satmouse

For activating a sat-receiver via an external infrared electronic transmission unit (Satmouse) a bi-directional data line, a short-circuit proof +5V and earth are provided via a 3-pin 3.5mm jack [1941].
The +5V is limited to approx. 140 mA using a current limiting switch [7812 and peripherals].

9.4 Deck electronics DE (DE part)

The deck interface IC MP63100FP [7463] contains the following functional groups:

- CTL stage (tape synchronisation)
- Sensor interface
- Power on reset
- Head drum motor driver
- Loading motor driver
- Capstan motor control

9.4.1 CTL stage

The IC M63100FP [7463] contains a read/write stage for the CTL track with the option of overwriting an existing CTL track without any interference. The playback stage is fitted with a "digital" five-stage AGC. This logic circuit identifies the size of the output signal supplied by the CTL head, and then selects the best amplification ratio in the playback stage using comparators.
The CTL head voltage can therefore vary greatly, if V_{max} / V_{min} is great. The slowest tape speed is in LP mode. The fastest speed is adjusted during rewind. To ensure that the duty cycle in the tape sync is always reproduced correctly in the conditions mentioned above (important for detecting VISS marks), the amplifier must not be overdriven.
The five-stage AGC alone cannot cover the large dynamic range of the input voltage. The amplifier is therefore also equipped with a low pass characteristic (fg = 3kHz typ.; internal).
In parallel with the CTL head is the RC cell comprising capacitor [2479] and resistor [3471]. The capacitor [2479], together with the CTL head inductivity, causes a resonance step-up at around 10 kHz and the resistor [3471] suppresses this step-up. This creates an aperiodic transient response in the resonance. Beyond the resonance frequency, there is an adjustment in terms of a steep fall in the frequency transmission characteristic. This effectively suppresses high-frequency pick-ups. The CTL head signal amplitude in standard play is around 1mVp (typ.) which means that the amplification for the playback amplifier must be correspondingly high. To avoid offset problems, a 100 F electrolytic capacitor [2490] is fitted in the negative feedback branch for DC decoupling.
The polarity of the playback amplifier can be changed using the Video Index Search System (VISS) voltage. This is the only way in which the P can write a VISS mark on the tape without spikes. The Write/Read (W/R) signal is used to switch over between record and playback:
W = "H", R = "L".

9.4.2 Power on reset (POR) generator

The POR generator contained in the M63100FP [7463] requires only one external capacitor [2477], which specifies the length of the POR pulse. For 33 nF, t_{POR} is approx. 30ms. The response threshold of the reset circuit is between 4.5 and 4.8 V. Supply fluctuations which are shorter than tPOR/ 100 area and which do not fall below 4.0 V, do not trigger the POR. The P is reset using the inverted POR.

9.4.3 The sensor interface :

The four comparators in the M63100FP [7463] are used to convert sensor signals to the logic level. The outputs are overload protected by a current limiter and thermal overload protection. Only the non-inverting input on each comparator is accessible from the outside. The other inputs are connected to an internal reference of 2.5V. The fixed hysteresis of the comparators of approx. 18 mV is also located internally.

The comparators are connected as follows:

Comparator 1: In = FTA, pin 39; Out = FTAD, pin 34:
FTA = threading tachometer. This signal comes from a forked light barrier in the deck. An infra-red light beam is interrupted by a 4-blade impeller (butterfly). The output amplitude for the light barriers should be less than 2V for the low level and greater than 3V in the high level to ensure a correct evaluation process. An additional hysteresis is created with a resistor [3476]. For unit versions <1W and FOME the external operation amplifier [7530B] is used to reduce the power consumption in <1W mode.

Comparator 2: In = WTR, pin 38; Out = WTRD, pin 33:
WTR = Winding tachometer right, from a reflection photoelectric barrier. The level is the same as for the FTA.

Comparator 3: In = WTL, pin 37; Out = WTLD, pin 31 :
WTL = Winding tachometer left, from a reflection photoelectric barrier. The level is the same as for the FTA.

Comparator 4: In = FG, pin 35; Out = FGD, pin 30: FG = capstan tachometer. This signal stems from an amplifier for the tachometer hall sensor on the motor unit [1946 pin 4]. The output impedance is 10 kOhm. The amplitude of the virtually sinusoidal signal is normally 1 Vp. It should not fall below 300 mVpp. It is AC-coupled via a capacitor [2485]. In order for a bias current to flow, the input pin 31 must be passed via a resistor [3474] to the reference voltage on pin 4. A capacitor [2480] for filtering out high-frequency interference is arranged in parallel to the bias resistor.

9.4.4 Interface to the head drum motor driver part

The head drum control voltage (speed and phase control information) is output via a P-output (7899-B pin 35; PWM 14-bit). This pulse-wide modulated signal is fed to the motor driver IC M63100FP [7463 pin 11] and integrated with the capacitor [2469]. This IC already has a completely integrated 'start-up' circuit fitted. For the commutation, the head drum motor driver uses the e.m.f. on the non-current carrying motor coil (transformer principle). The motor speed is also discharged from there at the same time. The phase of the head disc is discharged from a position coil. The speed and phase are multiplexed into one signal [7463 pin 6] and output, which means that the falling edge of the signal is available with a positive edge for the speed (FG/450Hz) and at 25Hz for the position pulse (PG).
The motor driver M63100FP [7463] is connected to the head drum motor on the motherboard using plug [1948].

- DRUM is the speed-phase control signal. The resolution is 14 bit.
- PG/FG is the combined POS/tachometer signal from the M63100FP [7463].

9.4.5 Interface to the loading motor driver part:

The loading motor driver part is constructed for use as a bridged dual power operations amplifier (OPAMP). It can supply max. +/-0.8A output current. The output current is limited to approx. 0.7A by the internal resistance of the loading motor (18 Ohm typ.) (start-up or motor is blocked). Between the IC outputs [7463, pins 22 and 24] there is a "Boucherot" circuit [3467] 1E, [2474] 100 nF for suppressing a spurious 3MHz oscillation from the output stage. One half of the bridge is controlled via the TMO line on pin 27 and acts as a comparator. The other half is an amplifier integrator with a 3.9 gain. A change in the input voltage (THIO) of between 0 and 5V on pin 25 results in a change in the output voltage of between 0V and almost Ub. With 50% modulation (THIO = 2.5 V) pin 24 has approx. 7 V. The 100nF capacitor [2473] in the negative feedback of the op-amp filters out the PWM frequency of approx. 39kHz. During POR, the P issues "L" to the THIO line, whilst TMO is "H". This ensures that no current flows in the motor for the duration of the POR pulse. This prevents the motor being destroyed in case of prolonged running or blockage. This arrangement also has a disadvantage, however. This is that if the 5 V supply fails (e.g. because the 5V fuse has blown), residual voltages may be passed to the IC inputs via the adjacent 14 V voltages. These residual voltages trigger the comparator and the op-amp in opposite ways, causing a short-circuit in the blocked loading motor after about a minute. To get around this problem, a separate voltage divider is used internally for the comparator. Both outputs on the M63100FP [7463] are then in "common mode" if this error occurs.

9.4.6 Interface to the capstan motor

The driver IC on the capstan motor is activated via connector [1946].
CAP is the signal for the capstan speed. This voltage may vary without load between 0 and 5 V.
The rotational direction of the motor is determined using CREV (capstan reverse). The maximum current input for the motor is limited to 1A. Typical values in PLAY mode are 0.2 ... 0.3 A.

9.5 Front end FV (FV part)

9.5.1 The front end comprises the following parts :

- TUMOD = Tuner (+ Modulator Option) (+Booster Option) (+Passive Loop Through Option)
- IF amplifier & video demodulator IC TDA 9817, [7705] with FM - PLL demodulator
- IF amplifier & video demodulator IC TDA 9818, [7705] with FM - PLL and AM demodulator
- FM stereo decoder TDA 9873 [7760]
- Multi-standard FM stereo, AM, NICAM decoder MSP3415D [7761]

9.5.2 The front end has been designed to receive the following systems:

- PAL B/G with FM stereo
- PAL 1 or PAL BG with NICAM stereo
- PAL BG with NICAM and FM stereo
- PAL BG/I SECAM L/L' with NICAM and FM stereo
- PAL BG SECAM DK with NICAM and FM stereo

- PAL B/G = /01,/02/16
- PAL I = /05 Pal I with UHF reception
- PAL I Ireland = /07 Pal I with VHF/UHF reception
- SECAM L,L', PAL BG/I = /39
- PAL B/G, PAL I, SECAM D/K = /55
- PAL B/G, SECAM DK = /58

The relevant layout is given in the version list on the circuit diagram.

9.5.3 Tuner modulator (TUMOD)

The tuner and modulator are fitted into the same housing. Both the tuner and the modulator are PLL-controlled. The reception frequency or modulator frequency is set using the IIC bus.
The amplification is determined by the AGC voltage at pin 5 [1701] (for operation, see IF demodulator section).

9.5.4 IF selection

The IF frequency of the video carrier is 38.9 MHz for all systems except SECAM L' (33.9 MHz).
For PAL BG-SECAM DK and for PAL BG/I-SECAM L/L' a quasi-split audio system is used; i.e. for video and audio carriers, separate surface-wave filters (OFW) are required [1704, 1703]. For all other standards an intercarrier system is used; i.e. a common OFW with audio stair-step can be used [1704] for video and audio carriers.
For the PAL BG/I-SECAM L/L' version, an additional circuit for suppressing the adjacent channel audio carrier is provided, which is set using coil [5704] to maximum suppression at 40.4MHz.

9.5.5 IF demodulator

TDA 9818
The IF signal from the tuner is processed by another demodulator IC of type TDA 9818 [7705]. The TDA 9818 is

used to demodulate pos. or neg. modulated video carriers. It is possible to generate a QSS-audio-IF signal or an intercarrier IF signal for demodulation in the audio demodulator [7761]. For the best possible video signal performance the IF signal is conveyed via an OFW [1704] according to the standard. The audio-IF carrier is selected in the audio OFW [1703] which is switched for SECAM L'. The output signal for this OFW is further processed in the TDA 9818. FM carriers are converted from the IF level into the audio IF position and further processed in the audio demodulator. The AFC coil [5702] on the TDA 9818 is adjusted so that when a frequency of 38.9 MHz is supplied to the IF output of the tuner, the AFC voltage on pin 17 on the TDA 9818 is 2.5V. The setting of the picture carrier frequency for SECAM L in the TDA 9818 is achieved by connecting pin 7 of the IC via a potentiometer [3730] to earth. The AFC voltage on pin 17 TDA 9818 should then also be 2.5V at 33.9 MHz. The HF-AGC is set using the AGC controller [3707] so that with a sufficiently large input signal (74 dBV), the voltage at the IF output on the tuner [1701, pin 17] is 550 mVpp. The setting must be carried out when the audio carrier is switched off. The demodulated video signal appears on pin 16 [7705]. The video drop [1705] reduces adjacent channel sound carrier and sound carrier remainders in the video.

TDA 9817
As for TDA9818, without the option for processing AM audio and positive video modulation (SECAM L,L').

9.5.6 Audio demodulator

Multi-standard audio processor MSP 3415D
The MSP 3415D [7761] is a multi-standard sound processor which can demodulate FM Mono/Stereo, NICAM and AM signals. The incoming signal is first controlled and then digitised. The digital signal is then demodulated in 2 separate channels. In the first MSP channel, FM and NICAM (B/G/I/D/K) are demodulated, whereas in the second MSP channel, FM and AM is demodulated again (NICAM L corresponds to NICAM B/G). These demodulated signals are selected digitally in the I/O and switched to the D/A converter on the outputs. Amplitude and bandwidth of the demodulated audio signals can be determined in the MSP using the corresponding commands via the I^{2}C bus. This means that the setting required for the best possible performance can be made.

FM stereo audio decoder TDA 9873
The TDA 9873 [7760] is a multi-standard A2 audio processor which can demodulate FM mono/stereo signals. The audio IF SIF2 is passed from pin 3 [7705] to pin 25 [7760]. The demodulated stereo signals AFL and AFR I^{2}C bus are available controlled on pins 1 and 2.

9.6 Video signal processing VS (VS part)

9.6.1 Switchover functions in the signal electronics IC LA71695xM [7004]:

The signal electronics IC LA71595M [7004] are controlled via the I^{2}C Bus on pins 23 and 24 by the AIO.
As groups 5 and 6 can only be transferred with a change in HP1, it must be ensured that during measurements the HP1 line is always connected to the SE IC or replaced by a corresponding signal.

REC/PB via IIC bus
During RECORD pin 30 must be passed via [7009] on 5V (IREV=LOW) to activate the video write current stages. To keep the transient condition of the write current as short as possible, the signal electronics IC is set to REC via IIC bus before the pin 30 change.

PAL/SECAM/MESECAM/NTSC via IIC bus

SP/LP/SLP via IIC bus

VIDEO INPUT SELECTOR SWITCH via IIC bus
In 1-scart units a distinction is made via the IIC bus between VFV (pin 36 / VID2) and VBS which corresponds to VIN1 (pin 38 / VID1). In 2-scart units the video input selection is made via IIC bus in the STV6401 [7904] and the SE IC is always on VBS (pin 38 / VIN1).

VIDEO ENTRY
The feature frame pulse FFP signal on pin 26 is used to enter the artificial picture pulse for playback features and the test picture for the unit installation procedure:

Loop through	< 0.8V
Test picture	= 1.2 ... 3.8V
Artificial picture pulse	> 4.2V

LP/SP head pair switchover
The switchover between the long play LP head pair and the standard play SP head pair is made via the HSC signal (pin 25).

4/x scanner in play back:SP head pair:1.2V <= HSC <= 2.8V
LP head pair: 0V<= HSC <= 0.8V
2/x scanner in play back:always 3.2V <= HSC <= 5V

Head switchover
The video head switchover is made using the HP1 signal (pin 11). To keep audio linear interference as low as possible, the HP1 polarity should be selected to be inverse and the HP1 level should be the same as the CROT signal on pin 10.

PB: SP1 / LP1: 1.2V <= HP1 <= 2.8V
SP2 / LP2: 0V <= HP1 <= 0.8V

Envelope curve comparator
If the ENVC signal (pin 94) is HIGH, the FM envelope curve on the LP head is greater than that on the SP head, and vice versa.

9.6.2 Recording

Luminance
The input signal (1-scart: pin 38 = scart , pin 36 = front end; 2-scart: pin 38 = input video selected using STV6401) is connected in the IC [7004] and is available uncontrolled on pin 32 as VREC (SECAM; VPS only unit data slicers). It reaches pin 31 via an electrolytic capacitor [2036]. In the IC [7004] the video signal first goes through an amplification control process (time constants determined by C [2035]). After the AGC the video signal reaches the FBC clamping stage (feed back clamp), then the video signal is divided onto 3 paths:

- **Loop-through signal path:** The video signal is amplified by 6dB following video entry and is available controlled on pin 29 as a VSB signal (OSD entry, data slicer -> I/O, front end,..).

- **Y-REC path:** The video signal passes via a 3.5 MHz low pass filter to vertical emphasis comprising the YNR block (part of this circuit block is used in REC for vertical emphasis) and a 1H-CCD delay line integrated into the SE IC [7004-C] and an external emitter follower [7006]. This vertical emphasis can be switched via IIC and is only active in LP. The Y-signal before the 1H-CCD can be measured on pins 43 and 45 on the IC [7004-C] (separated only by a coupling electrolytic capacitor). The Y-signal after the 1H-CCD is passed back from pin 46 IC [7004-C] via the E-follower [7006] on pin 41 IC [7004]. After the vertical emphasis the Y-signal passes via pin 21 [7004], the E-follower [7008] (the filter, on the base of the emitter follower is not active in REC mode (due to the low resistance of the output stage on pin 21 [7004]), via pin 21 [7004] and a clamping stage to the detail enhancer. The Y-signal is then passed to the non-linear emphasis, the linear emphasis (time constant via pin 18, 19 - due to the low resistance of the pin 18 output stage and the transistor [7010] introduced for impedance decoupling, the FM PB all-pass does not influence the linear emphasis) and the white/dark clipping stage. The signal generated in this way then triggers the FM modulator directly. The FM-Y-signal generated in this way is passed via the REC-EQ filter and the REC-FM-AGC1 to the Y-C addition point. The FM-Y-signal can be measured after the REC-EQ filter on pin 12 [7004].
- **C-REC path:** see Chrominance PAL Recording (6.2.2).

Chrominance PAL

The chroma signal is separated from the video signal after the FBC clamping stage (see "Luminance recording") by the BPF1 band pass filter and reaches the ACC stage via a delay element (D.E.) and a low pass filter (LPF). The ACC amplifier stage controls the chroma amplitude for the subsequent stages (time constant via capacitor [2038] on pin 14 [7004]). The chroma signal is then conveyed to the main converter (Main Conv.). The main converter mixes the 5.06MHz subcarrier with the 4.43 MHz chroma signal to the 627kHz chroma FM signal. The subcarrier is a mixture of 4.43MHz (the REC APC time constant on pin 65 compares quartz and burst frequency) and (40+ 1/8) fH = 627kHz (produced by 321fH -VCO corresponds to 8(40+1/8)fH, time constant pin 60/62 and phase rotation in accordance with the VHS standard, 10 [7004] (CROT)). Via a low pass filter (C_LPF) and the colour killer stage (KIL), the converted chroma signal reaches pin 72 on the IC [7004], where it is added directly to the Y FM signal IC internally via a capacitor [2007]. The colour killer can either identify the incoming signal itself (PAL yes/no, PAL: chroma signal out, SECAM L: chroma signal killed) or be set via the I^2C bus to PAL MESECAM or SECAM L. The quartz oscillation (pin 66) is used for chroma processing, in addition to the reference frequency, and also for generating the pulse frequency for the combined CCD on pin 49 integrated into the IC [7004].

MESECAM

The signal path is virtually identical to the path for PAL.

The differences are:
- No phase rotation.
- The filter characteristic for the chroma band passes becomes wider.
- Free-running quartz frequency

SECAM L

The video signal (VREC) from the SE IC pin 32 [7004] passes through SECAM L SE IC pin 15 [7072] and a band pass filter (4.3MHz BPF-A) and reaches the cloche filter (CA filter components pin 21) which reverses the Hf pre-emphasis on the sender side. The C-signal is then limited (LIM, time constant pin 18) and divided to 1/4 of the frequency in the frequency divider. The C-signal is suppressed in SYNC GATE during the H-sync. period. The harmonics arising in the division into four and the gating are suppressed in the band pass filter (1.1MHz BPF) and then pre-processed in the anti-cloche filter (filter components pin 8) for standard VHS recording. The amplitude on the REC-chrome signal on pin 11 [7072] can be set using the setting resistor [3088] on pin 10 [7072]. This REC-chroma signal is passed via transistor [7077] as a CSRP signal to SE IC pin 72 [7004] following an external drop (3.9MHz, suppression of the 3rd harmonics of the low frequency REC-chroma) and added to the FM-Y-signal in the SE IC.
As the SECAM SE IC (LA7339A) has an automatic cloche and anti cloche comparison, only the REC-chroma signal level is required to be set.

FM signal

After the addition of the FM-Y-signal and the C-signal, this FM-signal is adjusted by the REC-FM-AGC2 controlled by the IIC bus to the preset amplitude (reference: pin 74 [7004] resistor [3009]). The head pair is selected using the HSC control line.

9.6.3 Playback

FM signal

The FM signal coming from the scanner is amplified by approx. 60dB. Depending on the level of the HSC and HP1 line, the amplified FM signal is connected to pin 74 [7004]. The envelope curve signal for the head currently active (TRIV) is output on pin 93 [7004]. In addition, the envelope curves for the SP and the LP heads which read from the tape are compared and output as the ENVC signal.
The FM signal (FMPV) on pin 74 [7004] is used internally for Y, SECAM, MESECAM and NTSC M/N playback and externally for SECAM playback.

Luminance

The FM playback signal is first adjusted in the AGC stage to a constant level and filtered in the FM processing (PB-EQ). The signal exits the IC [7004] on pin 18, passes via an E-follower [7010] with drop (1.07MHz - only in SECAM units - to suppress additional chroma remainders externally) to a phase shifter [7003] and enters the IC once more on pin 17 [7004]. The FM-Y signal limited using the double limiter is demodulated (FM-DEM) and filtered using a low pass (SUB_LPF). The demodulated Y signal is also affected by the recording-side pre-emphasis. This now removes the linear de-emphasis at the base of the emitter follower [7008]. The filter circuit is effective, as pin 21 [7004] becomes an open collector output in playback mode, where the load impedance is determined by the de-emphasis circuit.
The Y signal is then clamped after the E-follower on pin 20 [7004], filtered using a low pass, and carried by a vertical noise canceller or dropout compensator (Y.N.R.). To do this the Y-signal exits the IC [7004] (out: pin 43, in: pin 41) and delayed by 1H in the internal CCD. The CCD-1H delay line is effective for the Y signal first as a comb filter (vertical noise suppression) and secondly as a line storage device for the dropout compensation. The subsequent switching stages are: The non-linear de-emphasis (NON_LIN DE_EMP), horizontal noise canceller (N.C.1 / N.C.2) and the picture control switching to the increase in edge steepness (PIC_CTL ANR; sharpness). The luminance signal is then added to the chroma signal (Y/C MIX) and output (pin 29 [7004]) as FBAS signal via a clamp (FBC), the video input (CHARA INSERT) and a 6dB amplifier (6dB_AMO).

Chroma PAL

This is first adjusted in the AGC stage to a constant level and filtered in the FM processing (PB-EQ). The signal exits the IC on pin 18 [7004], and passes via an E-follower [7010] with drop (1.07MHz). On pin 17, the FMPV signal is carried from the head amplifier to the IC [7007] signal electronics.
From the FM playback signal the 627 kHz chroma signal is filtered using the internal low pass (C_LPF). The ACC amplifier amplifies and controls the chroma amplitude. In the main converter (MAIN CONV), the chroma signal is mixed with 5.06 MHz back to the original 4.43 MHz. The 5.06 MHz are produced in playback from the free-running quartz oscillator and from the (40+1/8) f_H = 627 kHz frequency derived from the 321fH-VCO. After the main converter the chroma signal is freed as far as possible from crosstalk from additional traces using a 2H comb filter (internal CCD connections: pin 57 -> 54; pin 59 -> 52 and pin 51 -> 61). The chroma signal is then filtered using a low pass (LPF), checked by the colour killer, filtered once again by a band pass, looped through pins 72 and 71 and then added to the Y signal.

Chroma MESECAM

The signal path is virtually identical to the path for PAL.

The differences are:

- No phase rotation.
- The comb filter is not active.

Chroma SECAM L

During playback the FM signal is passed from the band on pin 74 [7004] after the E-follower [7002] (FMPV) to pin 13 [7072], where the amplitude is adjusted in the AGC and passed via the same band pass (1.1MHz BPF) as for recording. The NF pre-emphasis for the recording is then reversed using a cloche filter (external filter components on pin 8; the same components as for recording). In the subsequent stages the frequency of the signal is doubled, filtered using a band pass (2.2MHz BPF) and doubled once again. Then follows another band pass (4.3MHz BPF-B), and then the limiter (LIM) already used for recording. The signal is then suppressed again during the H-sync. period and passed through a band pass filter (4.3MHz BPF-A; also used for recording). Before the SECAM-chroma signal exits the IC on pin 17 [7072], an Hf pre-emphasis is carried out once more (anti-cloche; external filter components on pin 21; the same components as for recording). After pin 17 there is a drop at 2.4MHz which suppresses the 2^{nd} harmonic of the chroma from the band, a low pass filter which improves the harmonics of the high frequency chroma and a transistor [7073] which has an emitter connected to pin 72 (CSRP) on the SE IC [7004].

NTSC

During the playback of NTSC signals, the original NTSC chroma is converted into a PAL chroma signal. This requires an internal switchover in the IC in the chroma part:
The internal CCD is switched over on a 1H comb filter to reduce crosstalk.
The NAP switchover is activated and translates the 4.43MHz NTSC chroma signal into a PAL signal.
Line and picture frequencies remain unchanged in accordance with the NTSC standard.
The result is a 60Hz NTSC Y-signal with a 4.43MHz PAL C-signal.

PAL M,N

As for chroma PAL (6.3.3).

9.6.4 General

SECAM:

Automatic cloche and anti-cloche comparison: During the vertical blanking gap the external filter components (pin 21 or pin 8) on the cloche or anti-cloche are used to create an oscillator and to divide the resonance frequency produced, and compared with a frequency derived from the 4.43MHz oscillation (reference signal from the SE IC [7004]).
Depending on the deviation, more or less internal capacity is connected in parallel to the external cloche and anti-cloche filter components. This process is carried out during each vertical blanking gap and thus also improves the temperature stability.

Chroma selection for REC and PB pin 71 and 72 SE IC [7004]:

Both the PB chroma and the REC chroma in PAL (MESECAM, PAL M/N) and also in SECAM are passed into the SE IC [7004] via pin 71 [7004]. In all PAL and MESECAM modes the DC voltage is on the base of the output emitter follower pin 72 [7004] 3.2V and the both bases of transistors [7077] and [7073] of the SECAM chroma signals are at 0V -> the PAL/MESECAM chroma signal is added to the FM-Y signal or to the PB-Y signal, according to REC or PB. In SECAM PB mode only the transistor [7073] has 2.5V DC voltage on the base. In SECAM REC mode only the transistor [7075] has 2.5V DC voltage on the base.

9.7 Audio linear (AL part)

9.7.1 Audio I/O for the 1-scart version

The input is selected via the IIC bus control in the IC signal electronics [7004-A]. Either signal AIN1 (pin 76) or AFV (pin 80) is selected. The output signal AMLP (pin 96) is passed to scart 1 and to the HF modulator.

9.7.2 Audio I/O for the 2-scart version

The input is selected via the IIC bus control in the IC signal electronics [7004-A]. Either signal AIN1 (pin 76), AINF_AIN2 (pin 78) or AFV (pin 80) is selected. The output signal AMLP (pin 96) is always passed to the HF modulator.

9.7.3 Audio linear recording

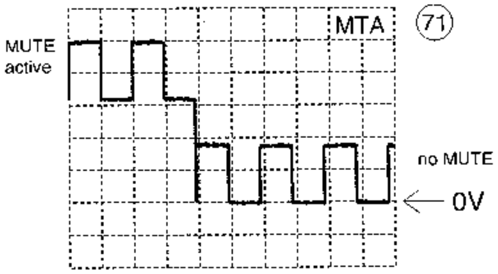
The signal inputs for recording or loop-through are pins 76,78 and 80 on the linear audio part of the IC LA71595 [7004-A]. During record and loop-through, the selected signal passes through the linear amplifier and then a mute stage and exits the IC on pin 96. This is the output which leads to the I/O part or the stereo units back to the AF part. The attenuation chain on pin 96 sets the required level for the ALC (Automatic Level Control) detector and the level for the recording amplifier.
The time constant for the ALC detector is specified using R3605 and C2602 on pin 77. R3634, R3640, C2626 and C2627 create the frequency response for the recording amplifier. The output for the recording amplifier is pin 7. The recording current is then added to the bias current via resistor R3642 and flows via the audio head to pin 4 where an electronic switch is closed in the IC.
In long play mode the frequency characteristic is modified to the RC network R3635, R3641, C2630, C2631 for the recording amplifier.
The coil L5600 and the transistor T7608 create the erasing oscillator for the main eraser head and audio track eraser head, and generate the bias current for the audio head. The bias current is set using potentiometer 3625.
To prevent spikes, the erasing oscillator is switched on slowly. This is created using the switching stage T7603, C2609, R3611 and R3613.

9.7.4 Audio linear playback

During playback the switch [T7604, T7607] is controlled by pin 99 and is closed. The playback signal from the head is amplified in the equaliser stage (time constant between pin 1 and pin 3) and passed to pin 1. The resistor R3633 and the capacitor C2619 determine the head resonance during playback.
In long play mode the frequency characteristic is modified using R3627, C2617 for playback.
The output of the playback amplifier (pin 1) is passed via the filter R3632, C2623 to pin 100 where an electronic potentiometer sets the playback level via the IIC bus. Amplifier and head tolerances are compensated here. The amplification can be compensated via software control (IIC bus) in service mode.

9.7.5 Audio linear muting

The mute stage in the linear audio part on the IC LA71595 [7004-A] is controlled by the combination control line MTA_CROT which is connected on pin 10 (VS part). The mute stage is activated in that the CROT control signal (square-wave pulse 1.7 Vss) is moved into the upper direct voltage range (> 2.2 V).



A: DC, 1 V/Div, 20ms/Div
IC7004-B PIN10 CROT/MTA

9.8 Audio HiFi - for stereo units (AF part)

9.8.1 General

All audio input and output selection switches, and the hi-fi FM audio signal processing, are located in the TDA9605 [7650]. This IC is controlled solely by the IIC bus. The carrier frequencies and band pass filter for the FM audio part are adjusted by the TDA9605 independently. This adjustment is started via the IIC bus following a mains reset. The RMHI signal is used as a reference for this [7650 Pin 41].

9.8.2 Audio I/O

The input and output selection switches are controlled exclusively by the IIC bus. Audio signals coming from the receiver part, the two scart sockets and the front sockets pass via pins 2 to 9 to the two input selector switches which select the relevant signals for the FM and the linear audio part. The output selector switch for SCART 1 and SCART 2 (pins 16,17 and 19, 20) select the relevant signal sources, independently from one another.
The RFAGC limits the maximum amplitude of the signal to the AMCO modulator (pin 13) to prevent overmodulation.

9.8.3 Audio HiFi recording

The signal coming from the input selector switch (INPUT SEL) reaches, via a level actuator (VOLUME L//R) and a low pass filter (LPF), the NOISE REDUCTION block, which compresses the dynamics during recording. The compressed signal is passed to both FM modulators (1.4MHz and 1.8MHz carrier frequencies). Both carriers are added and pass to the FM audio head amplifier. Via the recording / playback switch on the head amplifier, which is switched using the control line RMHI, the FM signal reaches the output (pin 35, pin 36, pin 37) on the FM audio processor and then the audio heads via the rotating transformer. The TRIA_ALM line forwards the size of both audio signals (1 VRMS = 2.68 VDC) to the AIO processor [7899-B]. This DC level information is required during recording by the SCART or front cinch socket to prevent overmodulation of the FM carriers. When the audio signal levels are too high, they are attenuated using the VOLUME controller via the I^2C bus.

9.8.4 Audio HiFi playback

The FM signal from the audio heads goes via the rotating transformer to the recording / playback switch (pin 35, pin 36, pin 37) on the head amplifier. After amplification in the head amplifier (66 dB), the FM signal reaches the HF-AGC (Automatic Gain Control), where the tolerances of the tape, the heads and the rotating transformer are balanced. Via the two band pass filter and limiters, the FM signals reach the PLL demodulators. Head change-over interference is suppressed using SAMPLE & HOLD stages (triggered by the RMHI signal). The demodulated signals are then expanded into the NOISE REDUCTION stage. The hi-fi signals are then available at the output selection switches. If there is no audio FM on the tape during playback, the output selector switch is switched over automatically from the IC to linear audio (input pin 22). In playback mode the TRIA_ALM line supplies the level of the FM envelope curve to the AIO processor [IC7899-B]. This level information from the FM envelope curve is used for the hi-fi tracking of the rotating FM audio heads to achieve the best possible playback quality (typically: 3.5 VDC).

9.8.5 Interface to the audio linear

In recording mode, the input selection switch NORMAL SEL in the TDA9605 [7650] selects the audio source for the linear audio part in the signal electronics IC LA71595 [7004 - A] and passes this signal to pin 21 (AMLR).
In stereo sets, the input selection switch on the signal electronics IC LA71595 [7004-A] is always set to IN2 (pin 78).
During playback the AMLP signal passes from the linear audio part in the signal electronics IC [7004-A] pin 96 to the linear audio input on pin 22 on the TDA9605 [7650].

9.9 IN/OUT (IO part)

9.9.1 Video

The entire video-I/O is carried out in 2-scart units using the matrix switch STV6401 [7904], which is controlled by the AIO via the IIC bus (SDA,SCL). To do this, the following signals are connected to STV6401 at the inputs: VFV-pin4, VIN1-pin6, VIN2-pin8, VOUT1)-pin10 (1)The VOUT signal is also passed through a voltage divider and a low pass [2906,3934,3928] and passed to the modulator where necessary via the emitter follower [7909]) and VFR-pin12 (front cinch input). The outputs OUT3/pin15 (scart 2) and OUT2/pin16 (scart 1) in the IC are fitted with a 6dB amplifier and convey the signal to the relevant scart socket. OUT1/pin2 has no amplifier; this signal (VBS) is passed on to the VS circuit parts for further processing:
In 1-scart units the SE IC [7004] selects the input video. SE IC original layout: VIN1 (the VBS line is used in the plan) pin 38 , VFV pin 36. The VOUT1 signal (scart 1 video out) is generated using an E-follower [7908] from the VOUT signal.

Audio for the 2-scart version:
The output signal for scart 1 is selected using the switch - IC HEF4053 [7911-C] using the MON control line (pin 9) from AMLP (pin 5) and AINF_AIN2 (pin 3). The output signal for scart 2 is selected using the switch - IC HEF4053 [7911-B] using the DEC control line (pin 10) from AIN1 (pin 2) and AFV (pin 1).

9.9.2 Decoder mode: (REC or STOP)

Program position with decoder (front end)
The front end signal (VFV or AFV1/2) is passed to the decoder connected to Scart 2 and from there, goes back to the VCR via VIN2 or AIN2L/AIN2R .
External input with decoder (9.2.2) is not possible for these program positions.

External input with decoder
The signal from scart 1-in (normally TV set) is passed to the decoder connected to scart 2. For scrambled programs, the decoder switches the pin 8 to high. The VCR then passes the decoded signal from scart 2-in to scart 1-out.

9.10 Follow Me (FOME part)

This circuit is used to compare the front end video with the video on scart 1 (video from the TV connected) in order to be able to save the stations in the same order as on the TV.
The video signals from the front end (VFV) and from the scart socket (VIN1) are "digitised" using filters and comparators [7530-C, 7530-D] and compared with one another [7531, 7532, 7530-A]. Low on the output for the circuit means that the picture contents for the two video signals are identical and that both receiver parts (TV and VCR) therefore have to be adjusted for the same station. Possible errors detected may result with similar signals, e.g. news programmes.

9.11 VPS/PDC, on-screen display (VPO part)

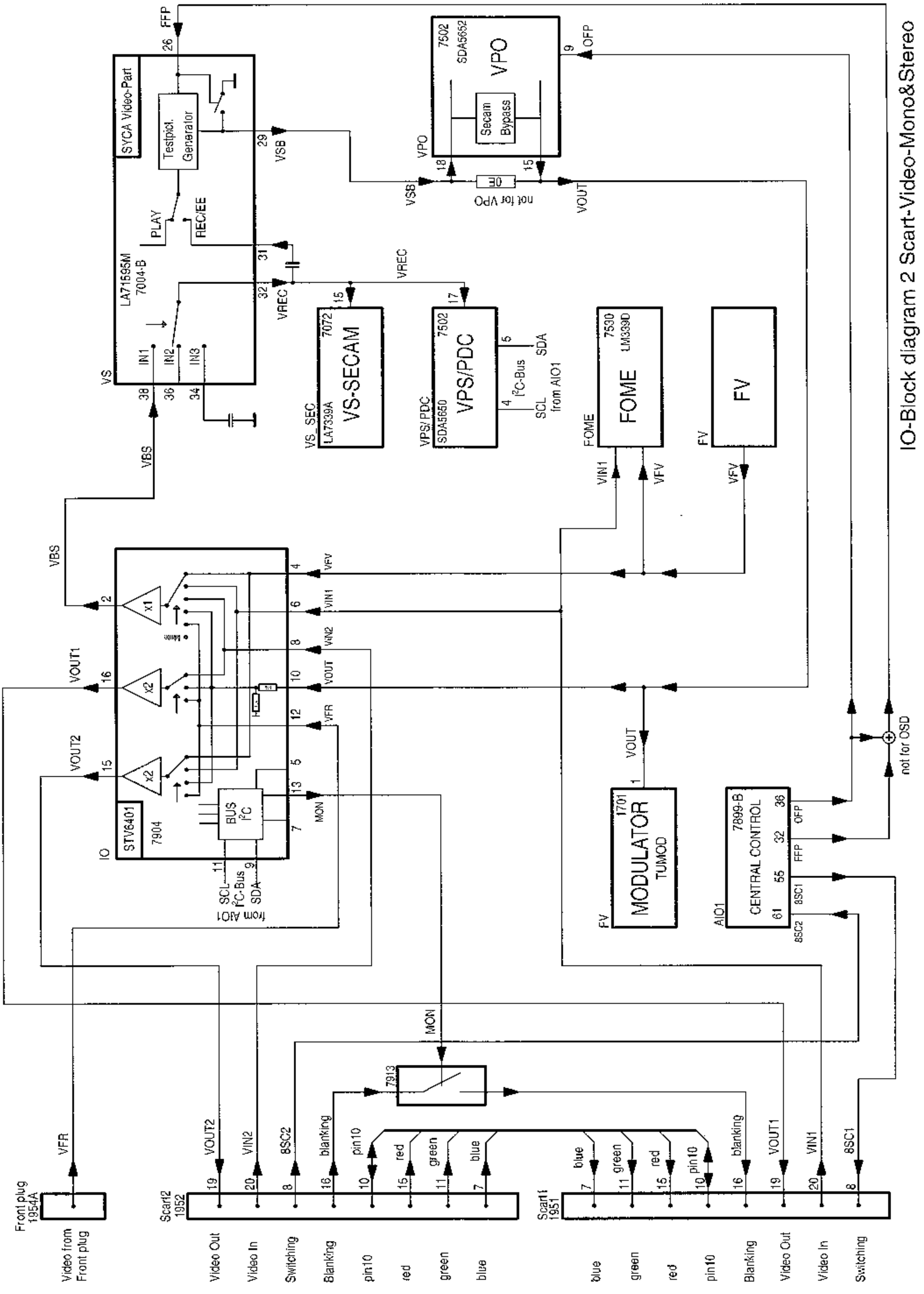
9.11.1 VPS/PDC

The VPS and PDC data is either decoded by the VPS-PDC decoder-IC SDA5650 [7502] or by the OSD-IC with integrated VPS, PDC decoder SDA5652 [7502]. Both ICs are compatible in terms of pins, despite any differences in the peripherals.
The VPS-PDC data are read from the vertical blanking gap and stored in the internal RAM. This data is read from the P via the I^2C bus.
The time can also be read from the TXT header line (required for "Time download"). The date is not called up from the TXT header (various write versions of the preset stations) but only via PDC format-1.
In the case of the SDA5650 [7502] the input video signal comes from the signal electronics IC LA71595M [7004-B pin 32] (VREC) via a 470n capacitor [2504] to the data slicer input on the SDA5650 (pin 17). For the SDA5652 the input signal from pin 29 (VSB) on the LA71595M [7004-B] comes via an emitter follower [7501] with a voltage divider to the data slicer input on the SDA5652 (pin1 17).

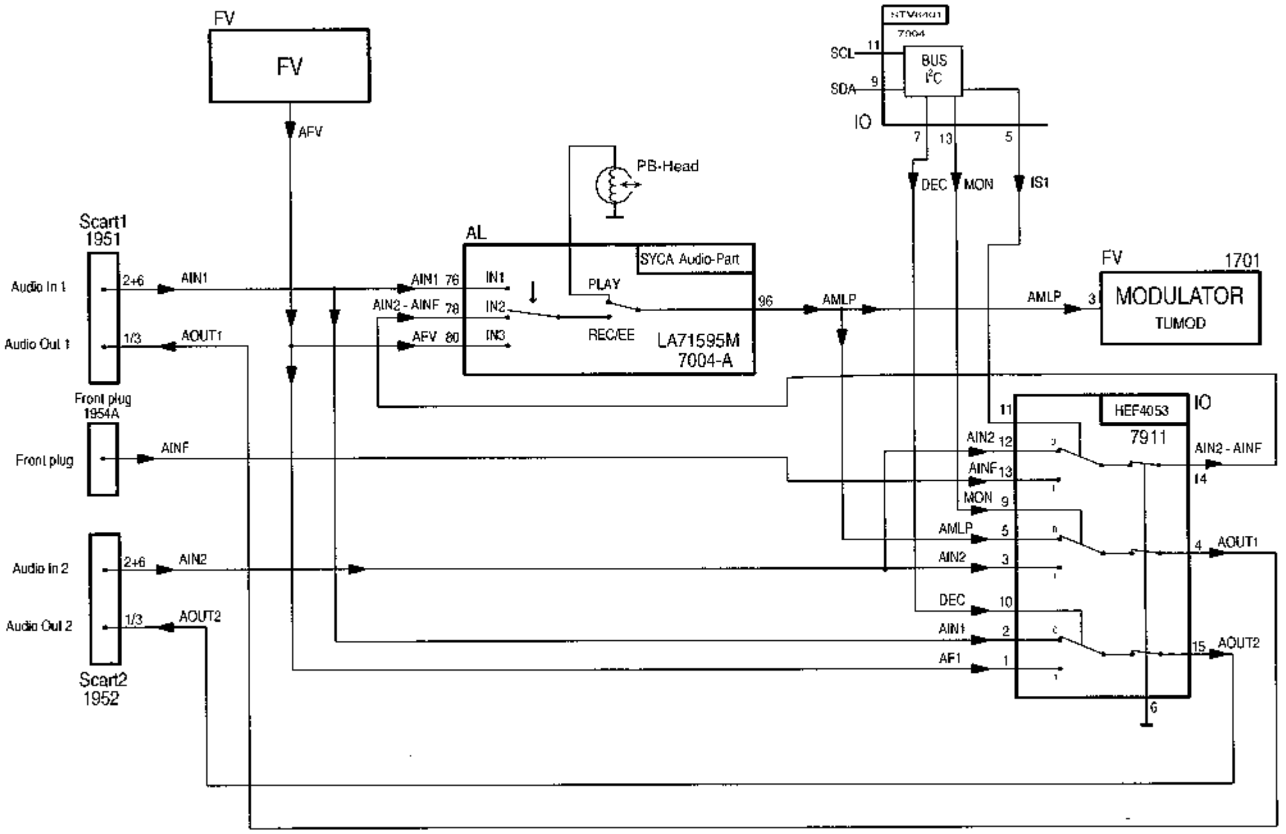
9.11.2 OSD-PART

The IC SDA5652 [7502] also allows both the generation of text keyboard matrices into a video signal and the generation of an entire picture (full page) for menu-control or if no background video is available.
The video signal (VSB) passes from the signal electronics IC LA71595M [7004-B pin 29] via a resistor [3512] to the input for the OSD-IC [7502 pin 18]. For keyboard matrices in Secam video signals, a bypass between video-in and video-out is activated via a switch inside the IC and a band filter [2507, 5502]. The output signal is available on pin 15.
A multiple of the doubled colour subcarrier oscillation from the signal electronics (2FSC/8.86MHz) is used as the system pulse for the IC. It is also used as a reference for generating the various OSD colours. The signal reaches the IC via a coupling capacitor [2509].
For the vertical synchronisation of keyboard matrices, an OSD frame pulse (OFP) is generated by the P [7899-B pin 36] and passed to the IC [7502] on pin 9. The horizontal sync-pulse is generated using an internal sync-separator and an internal H-PLL from the video signal on pin 17.
During full-page OSD (menu or no video) neither a vertical-sync (OFP) nor an H-sync is required, as in this mode, the OSD-IC generates everything from the system clock frequency, i.e. all the necessary pulses are generated internally from the 2FSC signal.

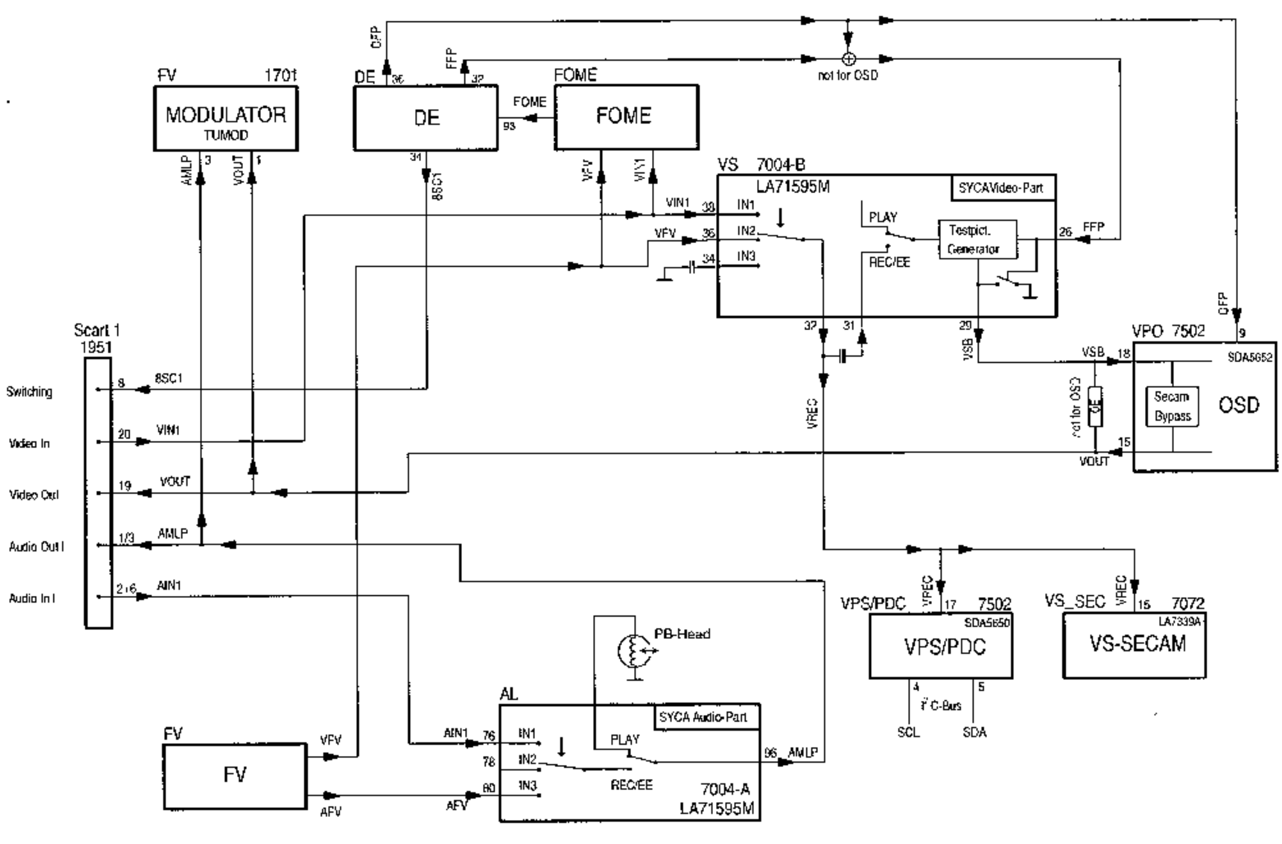
9.12 Simple Blockdiagram


IO-Block diagram 2 Scart-Video-Mono&Stereo

SYCA Video-Part
Testpict. Generator
LA71595M
7004-B
PLAY
REC/EE
IN1
IN2
IN3
VS
26 FFP
29 VSB
31
32 VREC
38
36
34
VBS
7502
SDA5652
VPO
Secam Bypass
9 OFP
18
15
VSB
VOUT
0E
not for VPO
VREC
15
7072
VS-SECAM
VS_SEC
LA7339A
17
7502
VPS/PDC
SDA5650
5 SDA
4 SCL
I²C-Bus
from AIO1
7530
LM339D
FOME
VIN1
VFV
FV
STV6401
7904
IO
x1
x2
x2
mute
BUS I²C
2
16 VOUT1
15 VOUT2
4 VFV
6 VIN1
8 VIN2
10 VOUT
12 VFR
5
13 MON
7
11 SCL
9 SDA
I²C-Bus
from AIO1
1701
MODULATOR
TUMOD
1
VOUT
7899-B
CENTRAL CONTROL
AIO1
36 OFP
32 FFP
55 8SC1
61 8SC2
not for OSD
MON
7913
VFR
VOUT2
VIN2
8SC2
blanking
pin10
red
green
blue
blue
green
red
pin10
blanking
VOUT1
VIN1
8SC1
Front plug
1954A
Video from Front plug
Scart2
1952
19 20 8 16 10 15 11 7
Video Out
Video In
Switching
Blanking
pin10
red
green
blue
Scart1
1951
7 11 15 10 16 19 20 8
blue
green
red
pin10
Blanking
Video Out
Video In
Switching

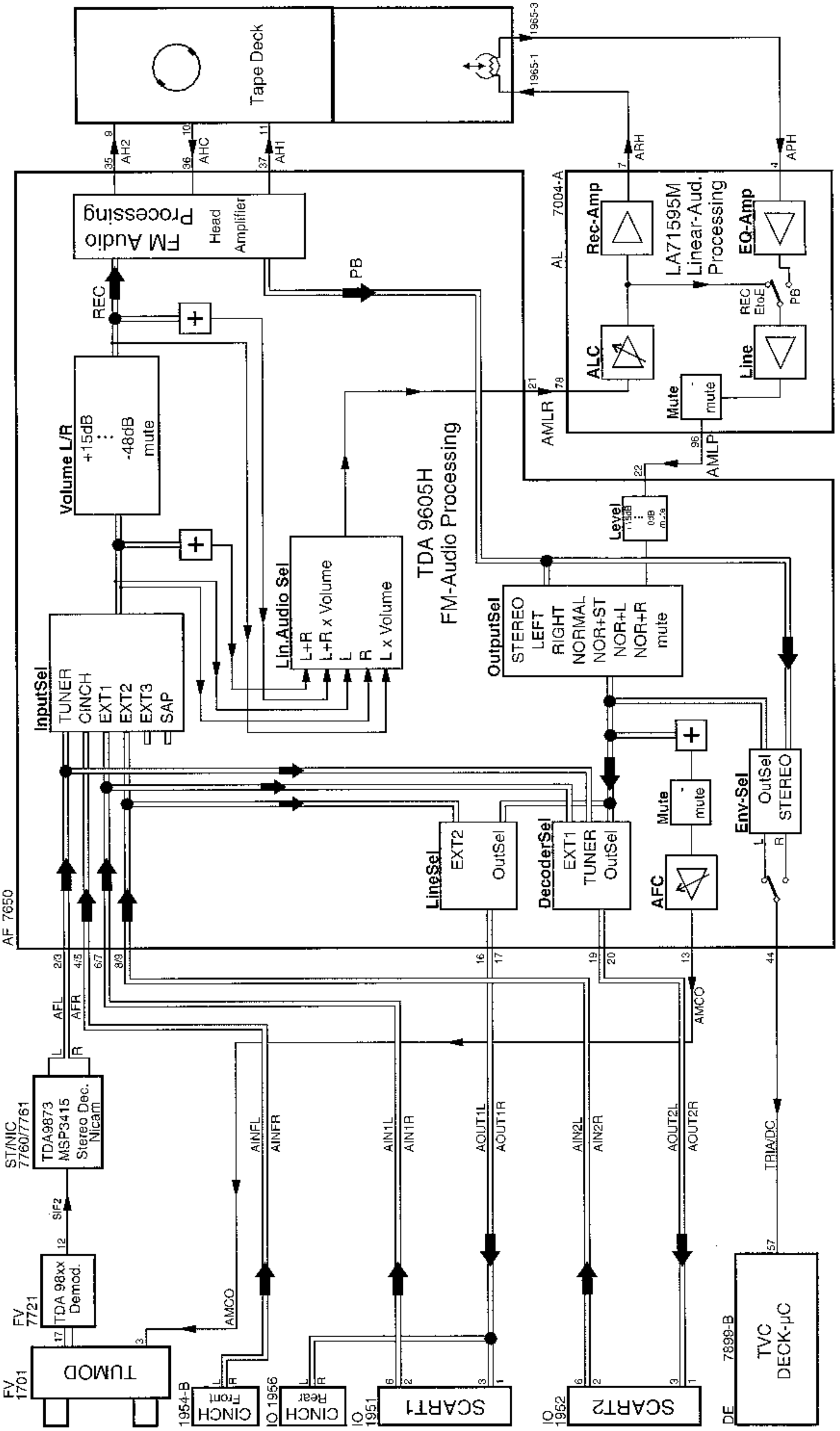

FV
FV
AFV
7004
SCL
SDA
BUS
I²C
IO
7
13
5
DEC
MON
IS1
PB-Head
AL
SYCA Audio-Part
Scart1
1951
Audio In 1
Audio Out 1
2+6
1/3
AIN1
AOUT1
AIN1 76
AIN2 - AINF 78
AFV 80
IN1
IN2
IN3
PLAY
REC/EE
96
LA71595M
7004-A
AMLP
FV
1701
MODULATOR
TUMOD
3
Front plug
1954A
Front plug
AINF
HEF4053
7911
IO
11
AIN2 12
AINF 13
MON 9
AMLP 5
AIN2 3
DEC 10
AIN1 2
AF1 1
AIN2 - AINF
14
4
AOUT1
15
AOUT2
6
Audio In 2
Audio Out 2
AIN2
AOUT2
Scart2
1952

IO-Block diagram 2 Scart-Audio-Mono


CFP
FFP
DE
36
32
not for OSD
FV
1701
MODULATOR
TUMOD
DE
FOME
FOME
93
34
8SC1
AMLP
3
VOUT
1
VFV
VIN1
VS 7004-B
LA71595M
SYCAVideo-Part
VIN1 38
VFV 36
34
IN1
IN2
IN3
PLAY
REC/EE
Testpict. Generator
26 FFP
37
31
29
VSB
VREC
CFP
VPO 7502
9
VSB 18
SDA5652
Secam Bypass
OSD
not for OSD
15
VOUT
Scart 1
1951
Switching 8 8SC1
Video In 20 VIN1
Video Out 19 VOUT
Audio Out I 1/3 AMLP
Audio In I 2+6 AIN1
VPS/PDC
VREC
17
7502
SDA5650
VPS/PDC
4
5
I²C-Bus
SCL
SDA
VS_SEC
VREC
15
7072
LA7339A
VS-SECAM
PB-Head
AL
SYCA Audio-Part
FV
VFV
AFV
AIN1 76
78
80
IN1
IN2
IN3
PLAY
REC/EE
96 AMLP
AFV
7004-A
LA71595M

QMB1 IO-Block diagram 1 Scart-Audio-Video-Mono

9.13 Simple Blockdiagram FM Audio / Linear Audio processing


Tape Deck
1965-3
1965-1
AH2
AHC
AH1
ARH
APH
FM Audio Processing
Head Amplifier
PB
REC
Volume L/R
+15dB
-48dB
mute
Lin.Audio Sel
L+R
L+R x Volume
L
R
L x Volume
TDA 9605H
FM-Audio Processing
InputSel
TUNER
CINCH
EXT1
EXT2
EXT3
SAP
OutputSel
STEREO
LEFT
RIGHT
NORMAL
NOR+ST
NOR+L
NOR+R
mute
Level
+15dB
0dB
mute
7004-A
AL
Rec-Amp
LA71595M
Linear-Aud. Processing
EQ-Amp
REC
EtoE
PB
ALC
Line
Mute
mute
AMLR
AMLP
LineSel
EXT2
OutSel
DecoderSel
EXT1
TUNER
OutSel
Mute
mute
AFC
Env-Sel
OutSel
STEREO
L
R
AF 7650
AFL
AFR
AMCO
ST/NIC
7760/7761
TDA9873
MSP3415
Stereo Dec.
Nicam
SIF2
FV
7721
TDA 98xx
Demod.
FV
1701
TUMOD
AMCO
AINFL
AINFR
AIN1L
AIN1R
AOUT1L
AOUT1R
AIN2L
AIN2R
AOUT2L
AOUT2R
TRIA/DC
1954-B
CINCH Front
IO 1956
CINCH Rear
IO
1951
SCART1
IO
1952
SCART2
DE
7899-B
TVC
DECK-µC

9.14 List of abbreviations

Signal	Description	Application											
5V_1WSTBY	+5V analog in < 1W mode	PS	AIO1	AIO2	DE								FOME
5V_STBY	+5V analog in STDBY mode	PS		AIO2	DE				FV		VPO	IO	
5VA	+5V analog	PS				AF		FM	FV	VS	VPO		
5VD	+5V digital	PS	AIO1		DE								
5VS	+5V analog for power on reset stage				DE								
5VS1	+5V analog for head wheel position				DE								
7NEG	-7V I/O-switches supply											IO	
8SC1	Scart 1 pin 8 output		AIO1									IO	
8SC1L	Scart 1 pin 8 output low		AIO1									IO	
8SC1M	Scart 1 pin 8 output medium		AIO1									IO	
8SC2	Scart 2 pin 8 input		AIO1									IO	
9-14VM2	Capstan motor supply, switched	PS			DE								
9VA	+9V analog	PS				AF							
9VASW	+9V analog stereo	PS						FM				IO	
10SC12	Scart 1/2 pin 10 in/out P50		AIO1									IO	
14AL	+14V analog	PS					AL						
14VM1	+14V for threading- and headmotor	PS	AIO1		DE		AL					IO	
18VNEG	-18V display supply	PS		AIO2								IO	
33V	+33V for tuner tuning voltage	PS							FV				
2FSC	2 fold sub carrier frequency									VS	VPO		
AEH1	Audio erase head						AL						
AEH2	Audio erase head						AL						
AFC	Automatic frequency control		AIO1						FV				
AFL	Audio FM Stereo left					AF		FM					
AFR	Audio FM Stereo right					AF		FM					
AFV	Audio-Frontend						AL	FM	FV				
AGC	Automatic gain control		AIO1						FV				
AH1	AudioFM-Head-1					AF				VS			
AH2	AudioFM-Head-2					AF				VS			
AHC	AudioFM-Head-Common					AF				VS			
AIN1	Audio input scart 1						AL					IO	
AIN1L	Audio input scart 1 left					AF						IO	
AIN1R	Audio input scart 1 right					AF						IO	
AIN2L	Audio input scart 2 left					AF						IO	
AIN2R	Audio input scart 2 right					AF						IO	
AINF_AIN2	Audio input front/scart 2						AL					IO	
AINFL	Audio left from front connector					AF						IO	
AINFR	Audio right from front connector					AF						IO	
AMCO	Audio to the modulator					AF			FV				
AMLP	Audio mono playback					AF	AL		FV				
AMLR	Audio mono record					AF	AL						
AOUT1L	Audio output from scart 1, left					AF						IO	
AOUT1R	Audio output from scart 1, right					AF						IO	
AOUT2L	Audio output from scart 2, left					AF						IO	
AOUT2R	Audio output from scart 2, right					AF						IO	
APH	Audio playback head						AL						
ARH	Audio record head						AL						
BLANKING	Blanking pulse RGB loopthrough											IO	
BLUE	Blue signal between scart 1/2											IO	
CAP	Capstan control voltage		AIO1		DE								
CREV	Capstan reverse		AIO1		DE								
CSI	Colour system information		AIO1							VS			
CSRP	Chroma-SEC-Rec-Playback									VS			
CSW	8V/14V switching for capstan motor	PS	AIO1										

Signal	Description	Application											
CSYNC	Composite sync pulse		AIO1							VS			
CTL1	CTL-Synch-1				DE		AL						
CTL2	CTL-Synch-2				DE		AL						
DEC	Audio switching voltage AIN1/AFV											IO	
DECK_INIT	Init switch		AIO1										
DRUM	Head motor speed phase signal		AIO1		DE								
ENVC	Envelope comparator signal		AIO1							VS			
FFP	Feature frame pulse		AIO1							VS			
FGD	Capstan tacho pulse digital		AIO1		DE								
FMPV	FM video playback									VS			
FOME	Follow Me (video signals equal)		AIO1										FOME
FSC	Sub carrier frequency									VS			
FTA	Threading tacho				DE								
FTAD	Threading tacho digital		AIO1		DE								
GREEN	Green signal between scart1/2											IO	
GND	Ground	PS	AIO1		DE	AF						IO	
GNDAF	Ground on C650/651					AF							
GNDAIO	Ground on C601					AF	AL					IO	
GNDAL	Ground on C603						AL						
GNDAL1	Ground on C602						AL						
GNDD	Ground digital	PS	AIO1	AIO2									
GNDDE	Ground digital deck		AIO1		DE								
GNDEO	Ground on C601						AL						
GNDFMS	Ground FM							FM					
GNDFOME	Ground FOME on C530												FOME
GNDFV	Ground FV-ZF							FM	FV			IO	
GNDKEY	Ground key			AIO2									
GNDLED	Ground led	PS	AIO1										
GNDM1	Ground capstan motor	PS			DE								
GNDS	Ground for DE-CTL ampl.				DE								
GNDVIO	Ground video IO								FV	VS	VPO	IO	FOME
GNDVPO	Ground VPO on C500/501										VPO		
GNDVS	Ground VS on C602/603					AF	AL			VS			
GNDVARI	Ground front cinch											IO	
HEHI	Heater for displaytube high	PS		AIO2									
HELO	Heater for displaytube low	PS		AIO2									
HP1	Head-Puls-1		AIO1							VS			
HSC	Head switch puls SP / LP		AIO1							VS			
I1WSTBY	Inverse < 1W switch	PS	AIO1										
ILED	LED-tower supply		AIO1										
IPOR	Inverse power on reset		AIO1	AIO2	DE								
IREV	Erase oscillator on/off		AIO1				AL			VS			
IRR	IR receiver pulse		AIO1	AIO2									
IS1	Audio switching voltage AINF/AIN2											IO	
KEY_IN	Key matrix voltage		AIO1	AIO2									
KEY_LED	Key led front shuttle		AIO1										
LH1	Longplay-Head-1									VS			
LH1'	Longplay-Head-1'									VS			
LH2	Longplay-Head-2									VS			
LH2'	Longplay-Head-2'									VS			
MON	Blanking loop through scart 1/2											IO	
MOT1	Scanner motor 1 phase				DE								
MOT2	Scanner motor 2 phase				DE								
MOT3	Scanner motor 3 phase				DE								

Signal	Description	Application											
MTA_CROT	Audio mute / Colour rotation on/off		AIO1				AL			VS			
OFP	Frame pulse		AIO1								VPO		
PBH	PB-switch									VS			
PG_FG	Head wheel position/-speed		AIO1		DE								
PGIN	Scanner-Motor-Pulse				DE								
PSS	PAL or secam-L		AIO1						FV				
RECP	Record protection		AIO1										
RED/C	Red signal between scart 1/2											IO	
RMHI	REC-Mute/HeadPuls-Audio		AIO1			AF							
SATCO	Satelite control signal		AIO1										
SB1	Secam band 1		AIO1						FV				
SCL	IIC bus clock		AIO1	AIO2	DE	AF		FM	FV	VS	VPO	IO	
SDA	IIC bus data		AIO1	AIO2	DE	AF		FM	FV	VS	VPO	IO	
SDA-VS	IIC bus data filtered to VS									VS			
SFS	Sound filter switch		AIO1						FV				
SH1	Standard play-Head-1									VS			
SH1'	Standard play-Head-1'									VS			
SH2	Standard play-Head-2									VS			
SH2'	Standard play-Head-2'									VS			
SIF2	Sound-interfrequency							FM	FV				
STBY	Stand by switch	PS	AIO1	AIO2	DE								
SYNC	Control track pulse		AIO1		DE								
TAE	Tape end detection		AIO1										
TAS	Tape start detection		AIO1										
THIO	Threading motor in/out		AIO1		DE								
TMO	Threading motor on/off		AIO1		DE								
TRIA-ALM	Tracking audio / audio level indication		AIO1			AF							
TRIV	Tracking information video		AIO1							VS			
VBS	Video input									VS		IO	
VFV	Video from frontend								FV	VS		IO	FOME
VIN1	Video input scart 1											IO	FOME
VISS	Control sync pulse inversion		AIO1		DE								
VMOD	Video to the modulator								FV			IO	
VOUT	Video from OSD part										VPO	IO	
VREC	Video record from I/O									VS	VPO		
VSB	Video from signal electronics									VS	VPO		
W_R	Control track write/read		AIO1		DE								
WTL	Wind tacho left				DE								
WTLD	Wind tacho left digital		AIO1		DE								
WTR	Wind tacho right				DE								
WTRD	Wind tacho right digital		AIO1		DE								

AF	Audio FM Processing	page 73
AL	Audio Linear	page 72
AIO1	Central Control	page 66
AIO2	Display Control	page 65
DE	Deck Electronics	page 67
FM	Audio Stereo Nicam	page 70
FV	Frontend	page 69
FOME	Follow me	page 78
IO	In/Out	page 77
PS	Power Supply	page 64
VPO	OSD, VPS/PDC	page 76
VS	Video Signal Processing	page 74

10. Tape deck

10.1 Drive assembly

This tape deck has three motors; one providing precision drive for the scanner unit; the second providing direct drive for the capstan and belt drive for the reel tables; the third motor drives the lift and tape threading/dethreading operations.

Special features are:
- Quick start
- Short winding time
- Automatic cleaning of video heads by cleaning roller

To obtain a high repair standard we have developped a range of service kit's. These kit's covers the spare parts which are engaged together.
The tape deck's sensors are located on the motherboard underneath the tape deck, and included in its circuitry, lay out and parts list.

10.1.1 Deck parts replacement

The procedure for the removal and refitting of the following parts is described; only the lift, the scanner, the capstan motor and the A/C head are fixed by screws.
All the other deck assembly parts are held only by snap hooks.

For the replacement of parts on the underside of the tape deck, remove the tape deck from the motherboard.

Manual extraction of cassette:
If, after the Eject button has been pressed, the drive does not unthread and eject the cassette, the dethreading/eject operation can also be carried out manually by turning the wheel at the rear of the threading motor.

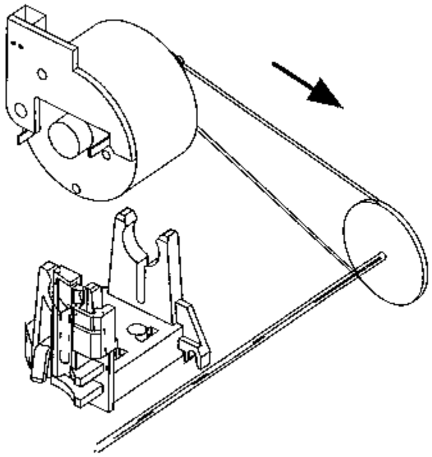
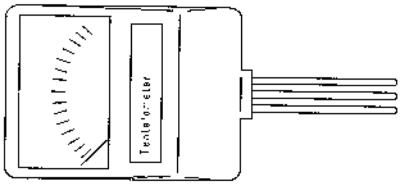


Figure 10-1

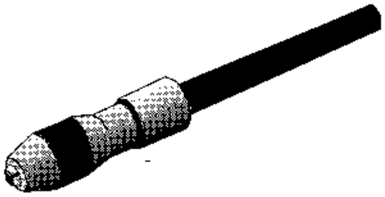
IMPORTANT:
After each repair has been carried out in the drive assembly, the first operation after repairing must be to bring the cassette compartment into „eject" position by hand.

Auxiliary tools for deck adjustment:

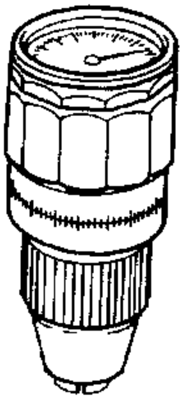


Tentelometer 4822 395 90584

Tool for tapetension adjustment 4822 395 50188



Handle 4822 256 90493



Torquemeter:	600 gf-cm 4822 395 90232 90 gf-cm 4822 395 80196

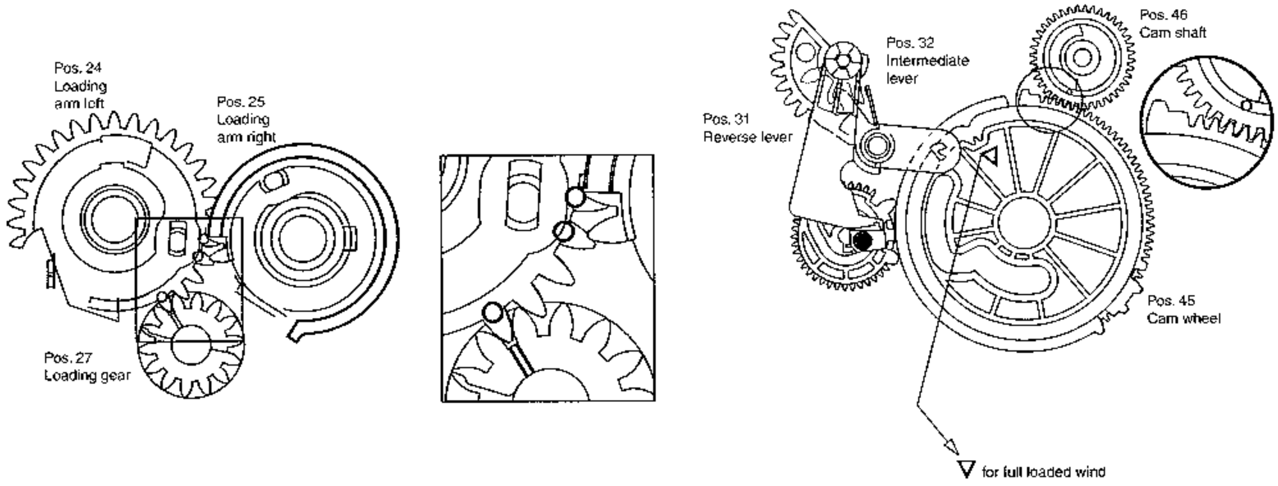
Post adjustment screwdriver 4822 395 50275

Testcassette 4822 397 30103
Nylon gloves 5322 395 94022

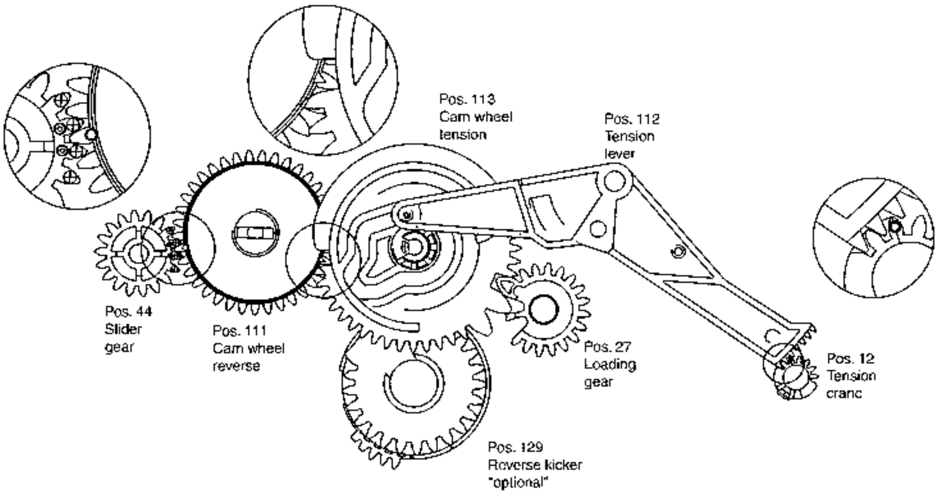
10.1.2 Deck layout diagram

Deck in position „threaded out". The following diagrams indicate the relative position of the gearwheels and levers when the deck is in the threaded out (cassette-compartment down) position.

Top view


Pos. 24
Loading
arm left
Pos. 25
Loading
arm right
Pos. 27
Loading gear
Pos. 32
Intermediate
lever
Pos. 31
Reverse lever
Pos. 46
Cam shaft
Pos. 45
Cam wheel
for full loaded wind

Underside view


Pos. 113
Cam wheel
tension
Pos. 112
Tension
lever
Pos. 44
Slider
gear
Pos. 111
Cam wheel
reverse
Pos. 27
Loading
gear
Pos. 12
Tension
cranc
Pos. 129
Reverse kicker
"optional"

10.1.3 The lift

Refitting the lift compartment:
Ensure the lift compartment is down and gear A is rotated one click stop anticlockwise from the down position.
The removal and refitting of the lift can be carried out in all deck positions with the exception of „eject" (ensure that gears 103/105 are free and if present the cassette loader gear 2 pos.105 is positioned to the rear).

To remove the lift:
Free the holding bracket (see figure 10-2) by rotating it up and back from the upper end.
Unscrew the 4 screws on the underside of the deck.
Carefully remove the lift vertically, noting the position of the record protect operating lever.

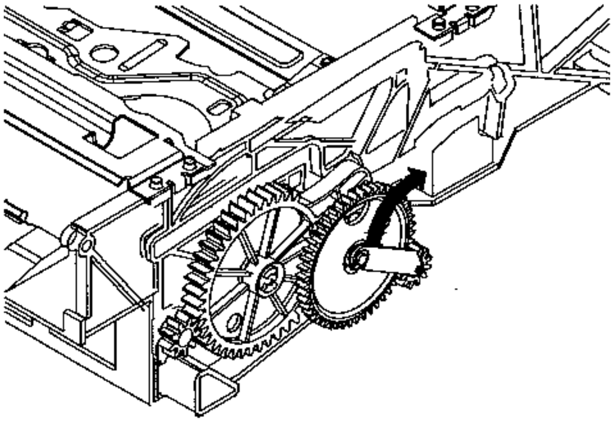


Figure 10-2

10.1.4 Scanner replacement

Removal:
Nylon gloves should be worn when handling the head disc.
Remove the deck from the set/mobo.
Unscrew the three scanner screws on the underside of the deck.
Pull out the scanner from the top. (see figure 10-3)

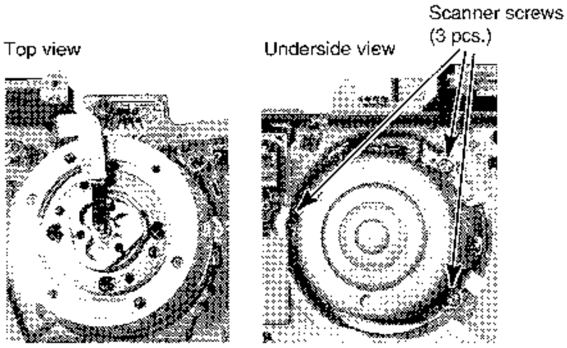


Figure 10-3

Installation:
Insert the scanner (with protective cover) carefully from top. PCB and flex foil to the rear.
Be shure that the scanner is engaged to the referenc pin located on the chassis.
Turn the tape deck, holding the scanner in the deck by hand and fix it by use of the tree scanner screws.
Remove carefully the protective cover from top.

After replacing the scanner, carry out the following adjustments and checks:
Head switching puls.
Writing current adjustment.
Tape path alignment.
Check and adjust if necessary.

10.1.5 A/C Head (Combi head) (Pos. 36)

Remove the fixing spring (A) (see figure 10-4)
Remove the fixing screw and replace the A/C head.
Use a new fixing spring (included with new A/Chead) for reassembly.

After the A/C head has been replaced, all adjustments described in paragraph "A/C Combi head" and paragraph 10.2.2 have to be carried out.

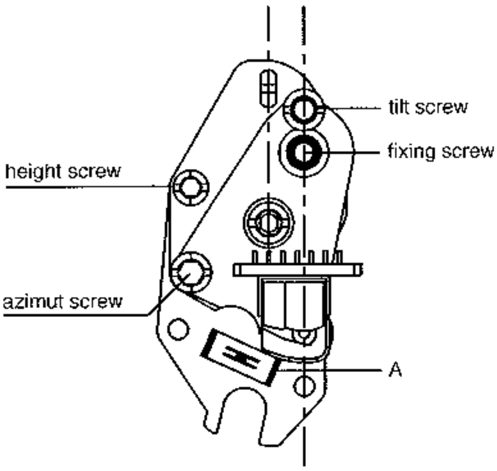


Figure 10-4

10.1.6 Threading motor (Pos. 38)

Remove the belt and disconnect the connector plug.
Remove the threading motor from the motor supports (see figure 10-5).

During reassembly ensure that the threading motor is correctly located in the front and rear supports.

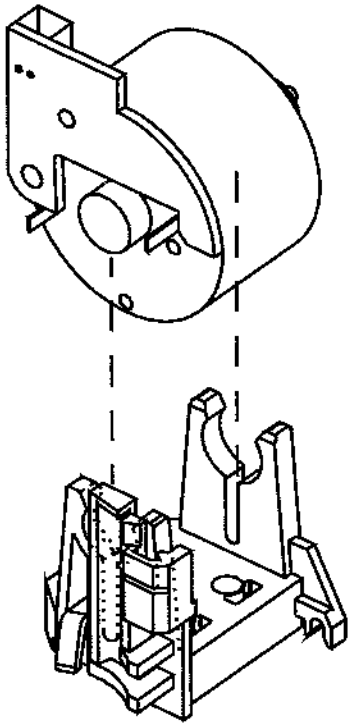


Figure 10-5

10.1.7 Capstan motor (Pos. 127)

Remove the tape deck.
Remove the belt (pos.126) on the underside;
Remove the three capstan motor fixing screws (see figure 10-6) and withdraw the capstan motor downward from the drive assy.
The reassembly is carried out in reverse order. Make sure that the capstan is free of grease.

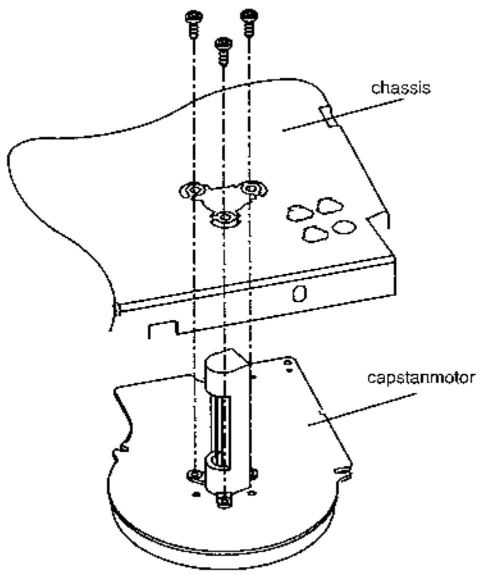


Figure 10-6

10.1.8 Pressure roller (Pos. 37)

Remove the tape deck.
Unhook and remove the pressure roller tension spring.
Release the pressure roller guide (pos. 41) from the guide in the threading motor holder by pressing the top of the motor guide rearwards and rotating the pressure roller guide assembly clockwise by approximately a quarter of a turn (see figure 10-7). The pressure roller and guide can now be lifted clear.

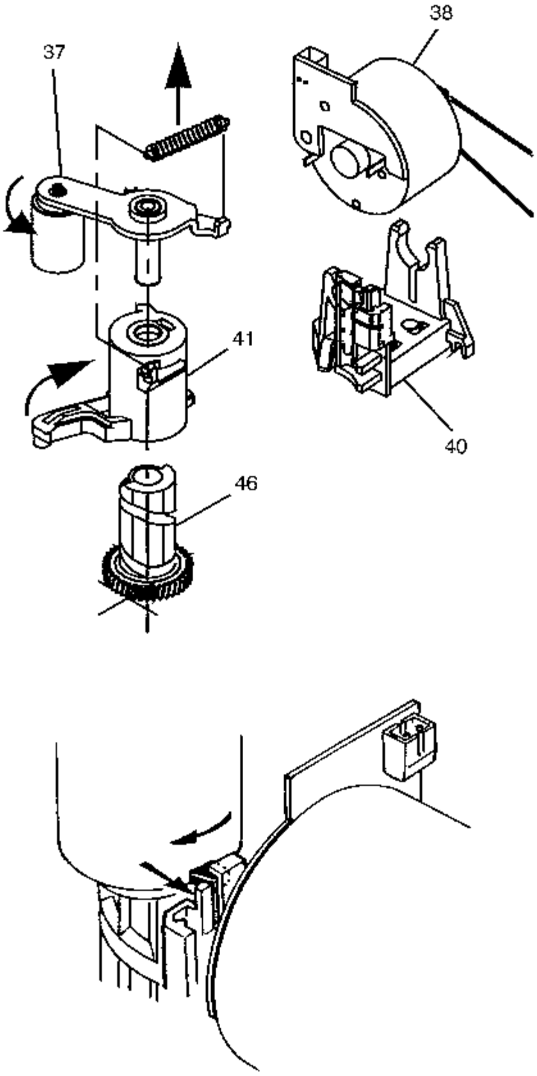


Figure 10-7

Ensure that no grease from the pressure roller guide gets to the capstan or pressure roller.
The reassembly is carried out in reverse order.

10.1.9 Roller unit right (Pos. 26)

Remove the tape deck.
Compress the two snap hooks by means of a pair of tweezers and remove the roller assy from the roller unit right (see figure 10-8).
Unhinge the loading arm right fromthe holding plate and push the latter towards the front of the deck to remove from the guide (right).

NOTE:
During reassembly ensure the link from 25 is engaged in the hole of the holder plate 26.
After replacing the roller unit (right), the tape path has to be checked, and adjusted if necessary.

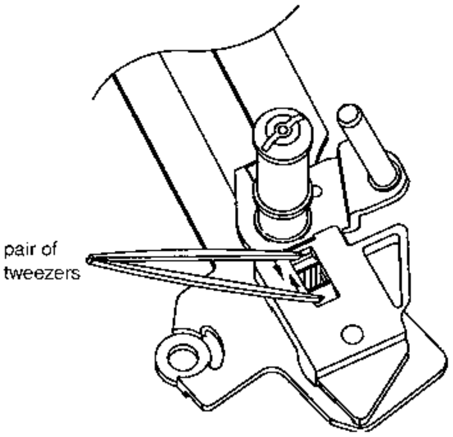


Figure 10-8

10.1.10 Roller unit left (Pos.23)

Set the drive assy to „Eject" position.
Unhook the tension arm spring (pos. 11), to avoid the tension arm spring being pre-loaded.
At the bottom side of the drive assy remove the tension lever (pos.112).
Compress the two snap hooks by means of a pair of tweezers and remove the roller assy (A) from the plate (B).
Unhinge the loading arm (left) from the holding plate and remove the latter downward from the drive assy through the recess in the chassis (see figure 10-9).
The reassembly is carried out in reverse order.

NOTE :
During reassembly

1. Place the carriage holding plate in the assembly with the half-round cutout nearest the rear of the deck.
2. When the loading arm is refitted ensure the pin on the underside of 23 is through the link of 24B.

After replacing the roller unit (left) the tape path has to be checked (see division 10.2.1 Tape path), and adjusted if necessary.

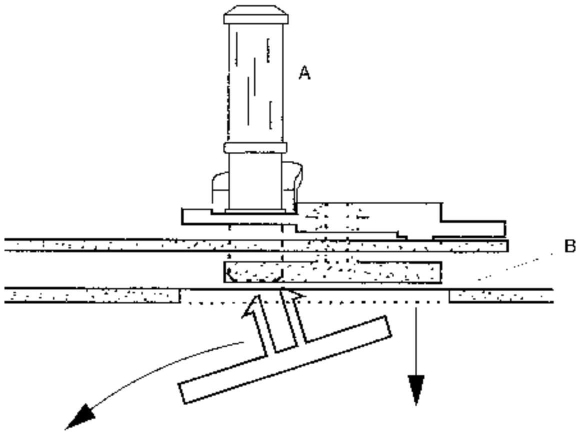


Figure 10-9

10.2 Adjustments

Adjustments must not be made in the service position.

10.2.1 Tape path

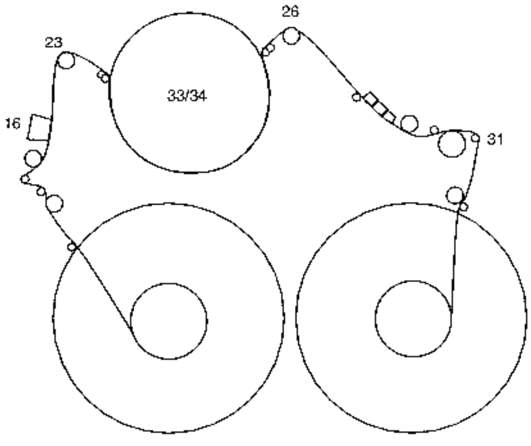


Figure 10-10

Roller left unit/roller unit right

Preparation:
Connect one input of a dual trace oscilloscope to observe the tape sync pulse CTL. The other input (DC coupled) to observe the tracking information TRIV.
Trigger the oscilloscope externally on the head pulse HP1 ("SWIN").
Playback the black and white section of the alignment test tape.
Set the deck in the condition where the video heads are running along the upper edge of the tracks only by:

- Call the service test program (see chapter 5.2 Service test program).
- Activate manual tracking (service test program step 03) and watch the tape sync pulse move to the left in relation to the TRIV signal.
- Note the extreme left hand position reached by the sync pulse, repeat as necessary.
- Stop the movement of the pulse when the TRIV signal reduces to 1/2 to 2/3 maximum amplitude by pressing the normal play button. A noisy picture (disturbances) is visible on the TV set and the CTL pulse should be to the left of the display.

The recorder will hold this position until the service test program step 03 is left.
This condition works only if X-distance is adjusted.

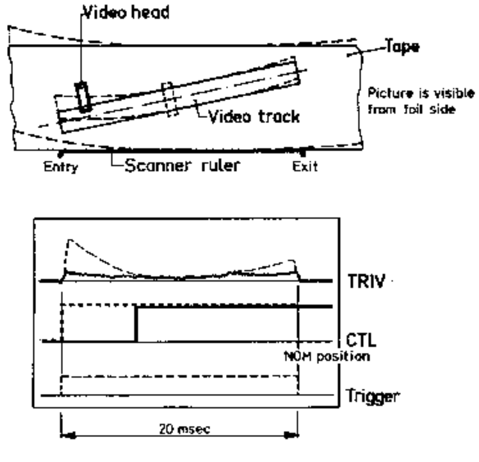


Figure 10-11

Adjustment:
Adjust the left and right roller units to make the tracking signal TRIV straight and flat as possible (see figure 10-11).

A/C Combi head

Tilt angle adjustment
Set the drive to feature mode (e.g. +7)

Adjustment :
By means of the tilt angle adjusting screw move the tape until the lower edge just touches the tape guide A1 (see figure 10-12) the tape must not be distorted at the lower edge (by pressing onto guide).

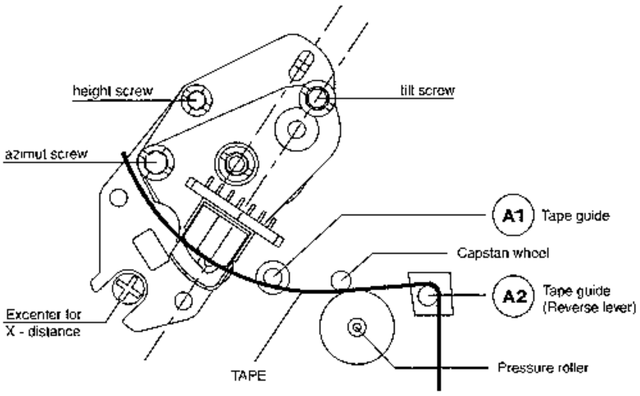


Figure 10-12

Adjustment of the azimuth angle and the head height:
Connect an oscilloscope to the linear Audio output.
Play the section of the test cassette with the audio signal 400 Hz.
Adjust for maximum output voltage by means of the height adjustment screw
Play the section of the test cassette with the audio signal 8 kHz.
Adjust to maximum output voltage by means of the azimuth adjustment screw (see figure 10-12).
If necessary, repeat this procedure
Check the tilt angle adjustment
If the tape path was completely out of adjustment or if several components in the tape path have been replaced, it is possible, that the adjustments described in paragraph "Roller left unit/roller unit right" and paragraph "A/C Combi head" have to be repeated several times.

10.2.2 Adjustment of the horizontal distance (x-distance)

Before this adjustment is carried out, insert the test cassette (start from Eject position). Call the service test program (tracking value will take up its nominal position) and press the „play" button.
Playback the black/white part of the test cassette.)
Display the TRIV signal on an oscilloscope (DC-coupled) and adjust for maximum voltage by means of the excentric screw (see figure 10-12).

10.2.3 Brake band and tape tension

Due to further development it is no longer necessary to make theseadjustments after replacement of the brake band.
If the brake band or tape tension are completely misadjusted, set them to a center position; set the drive to „play" and adjust the brake band until the edge of the elbow of the tape tension arm is aligned with the left inner edge of the left guide (see figure 10-13).

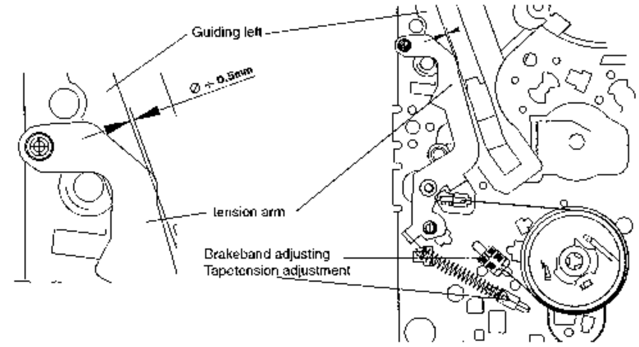


Figure 10-13

10.2.4 Friction clutch control check

Set the drive to „Play" position.
Place the torquemeter on the right reel.
Turn the capstan motor to move the right reel clockwise.
Keep turning, until the indication at the torquemeter no longer changes (see figure 10-14).
The torque has to be 10,5 mNm +/-25% (105gFcm +/-25%)

10.2.5 Reverse brake control

Set the drive to „Reverse" position.
Place a torquemeter on the right reel and turn the latter counterclockwise, until the reel just starts to flip.
The value indicated at the torquemeter has to be 7mNm +/- 3mNm (70 gFcm +/-30gFcm) (see figure 10-14).

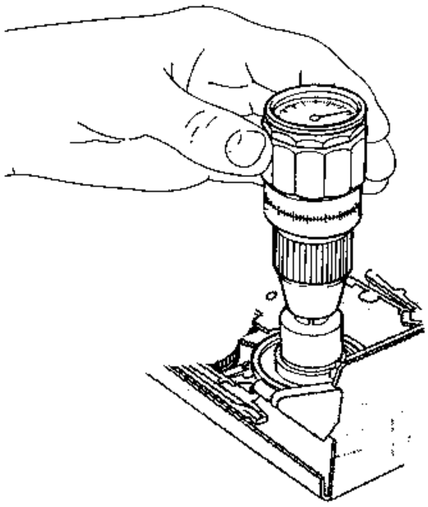
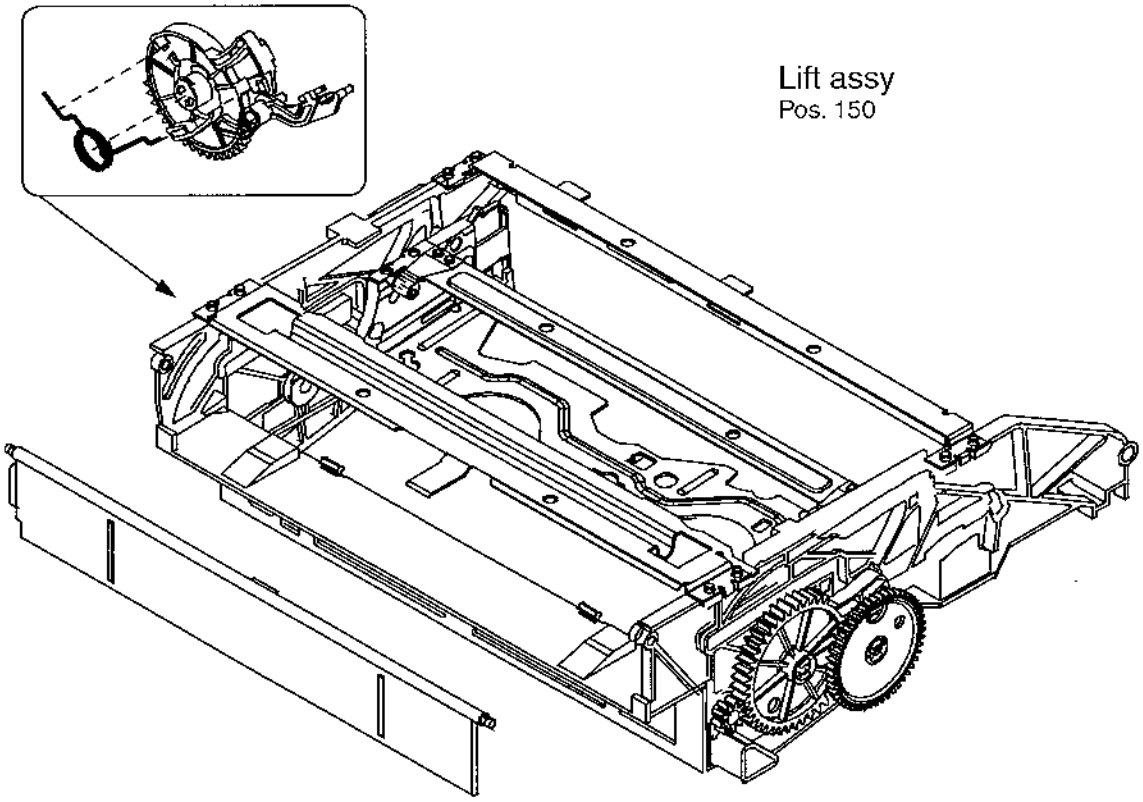
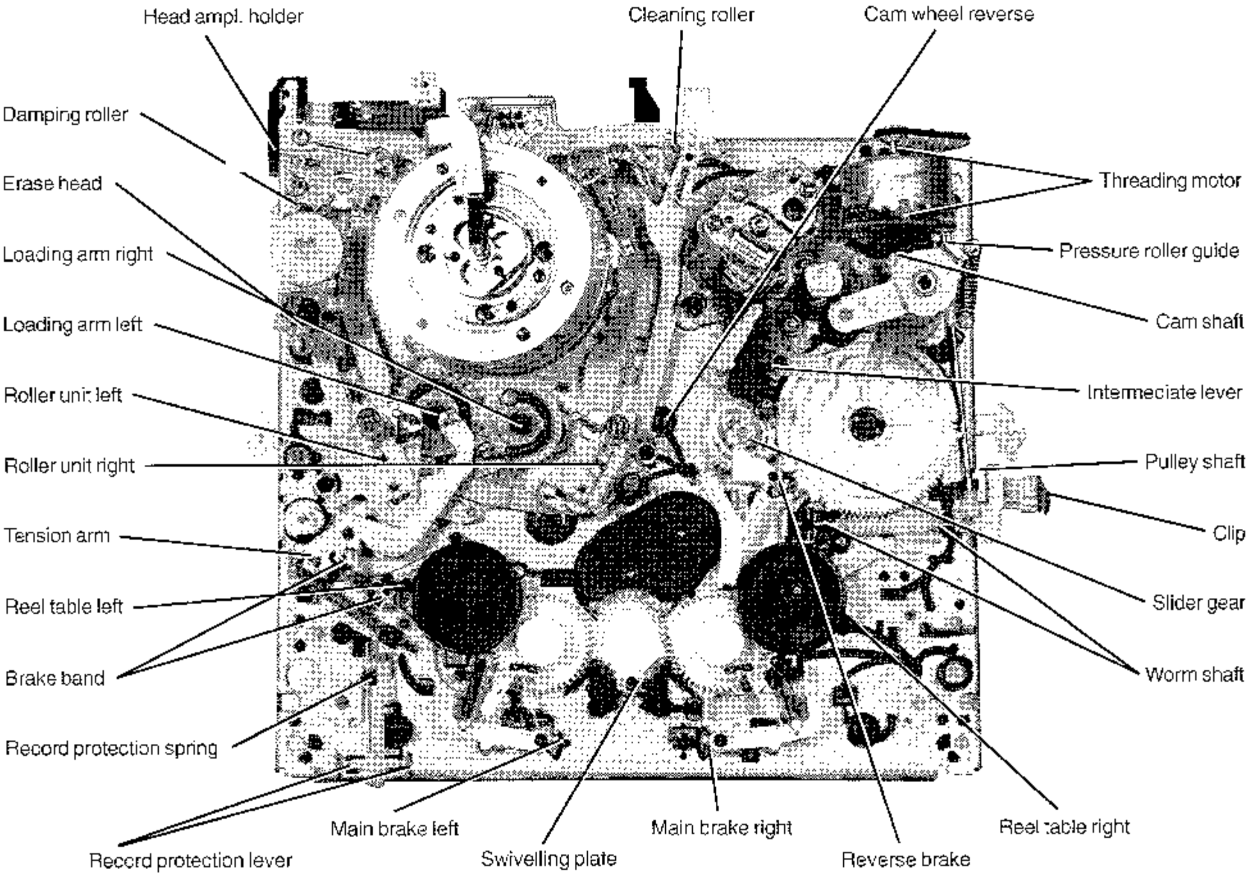


Figure 10-14

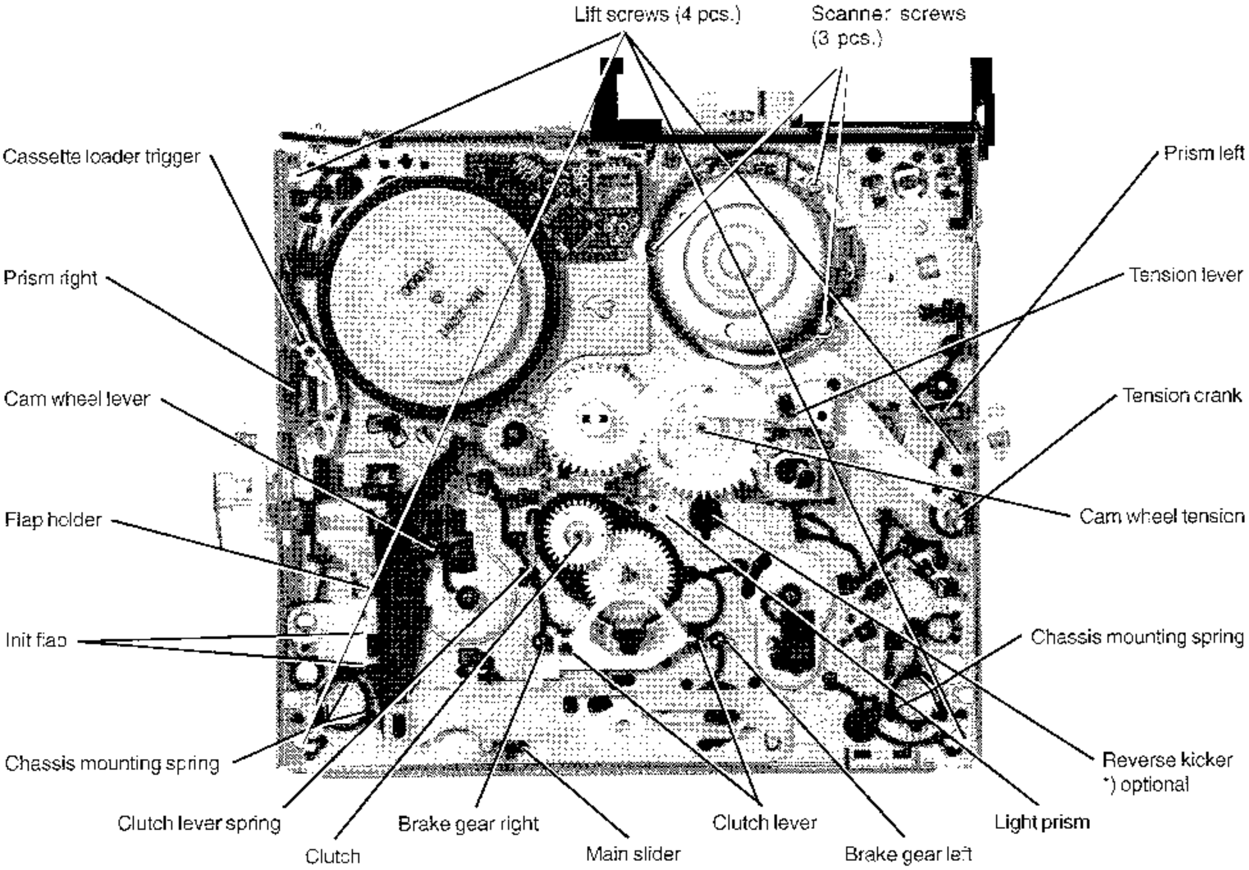


In order to make the replacement of the deck parts easier, the snap hooks are marked with an arrow.

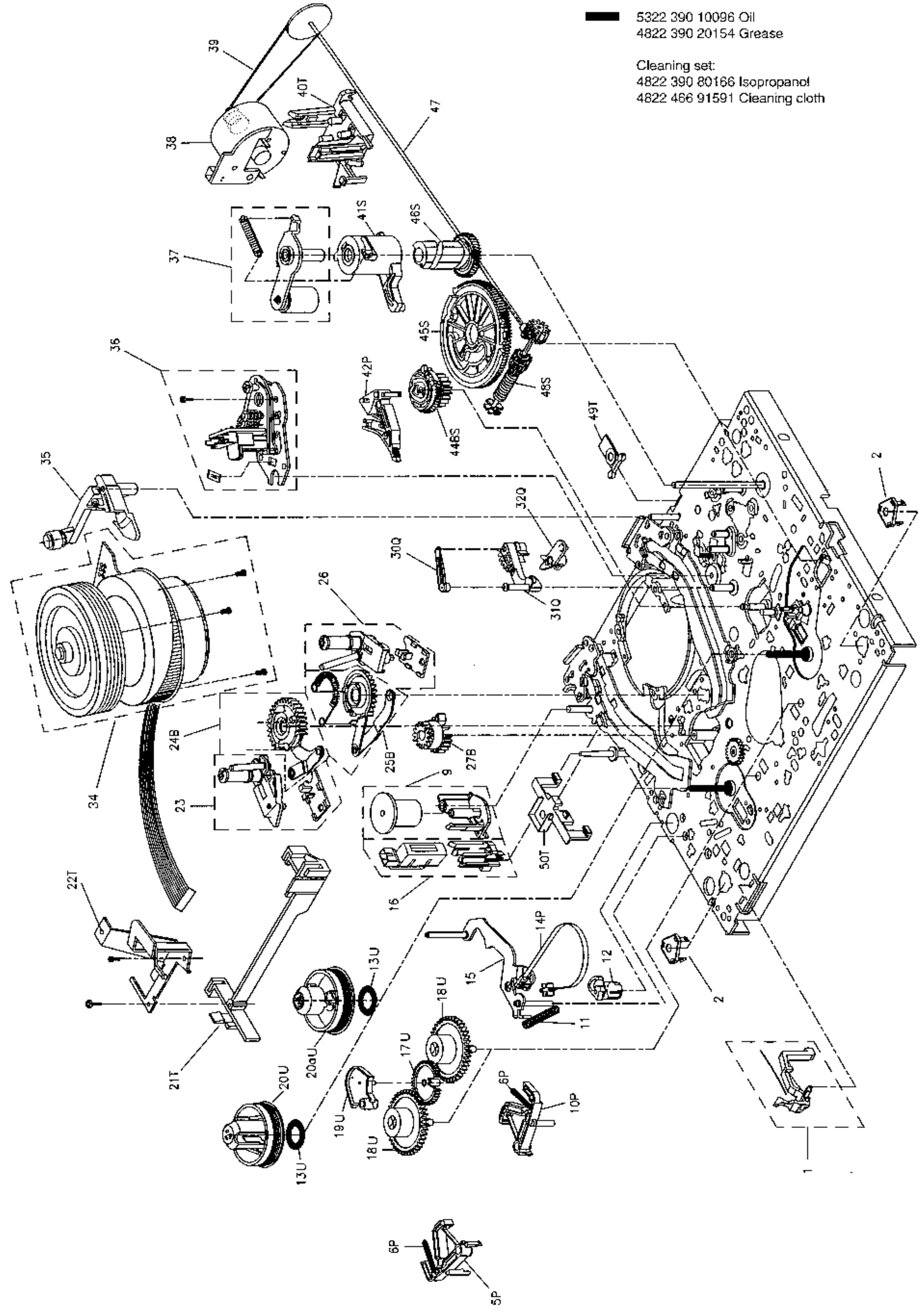
TOP VIEW


Head ampl. holder
Cleaning roller
Cam wheel reverse
Damping roller
Erase head
Loading arm right
Loading arm left
Roller unit left
Roller unit right
Tension arm
Reel table left
Brake band
Record protection spring
Record protection lever
Main brake left
Swivelling plate
Main brake right
Reverse brake
Reel table right
Threading motor
Pressure roller guide
Cam shaft
Intermediate lever
Pulley shaft
Clip
Slider gear
Worm shaft

UNDERSIDE VIEW


Lift screws (4 pcs.)
Scanner screws
(3 pcs.)
Cassette loader trigger
Prism right
Cam wheel lever
Flap holder
Init flap
Chassis mounting spring
Clutch lever spring
Clutch
Brake gear right
Main slider
Clutch lever
Brake gear left
Light prism
Reverse kicker
*) optional
Chassis mounting spring
Cam wheel tension
Tension crank
Tension lever
Prism left

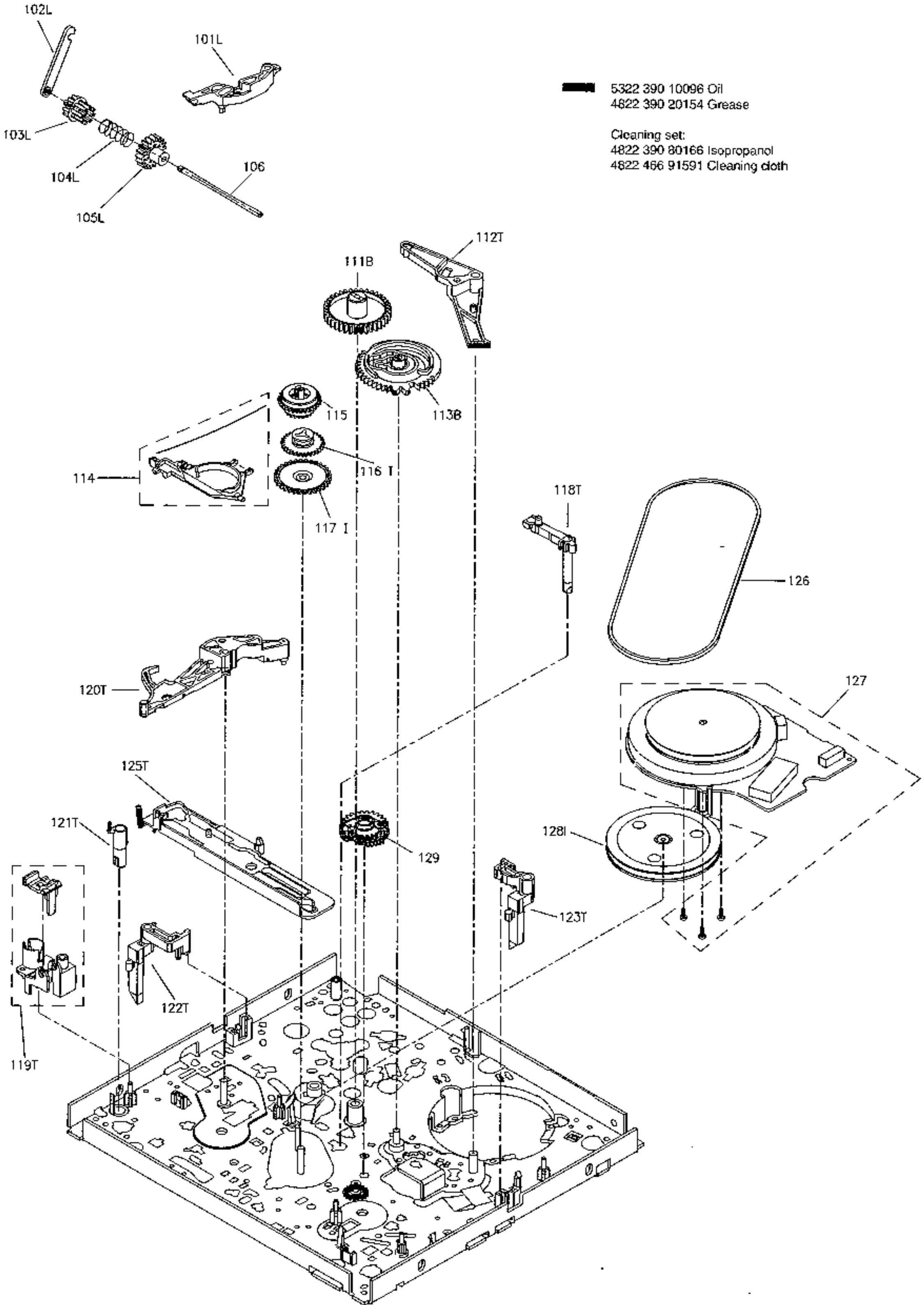
10.3 Deck exploded view (TOP)


■ 5322 390 10096 Oil
4822 390 20154 Grease

Cleaning set:
4822 390 80166 Isopropanol
4822 466 91591 Cleaning cloth

39
40T
47
38
41S
46S
37
45S
36
42P
48S
44S
49T
2
35
32Q
30Q
31Q
26
24B
25B
27B
9
34
23
50T
16
22T
14P
12
13U
15
18U
11
2
21T
20aU
17U
6P
10P
20U
19U
18U
13U
1
6P
5P

10.4 Deck exploded view (BOTTOM)


102L
101L
103L
104L
105L
106
112T
111B
113B
115
116 T
114
117 I
118T
126
127
120T
125T
121T
129
128I
123T
122T
119T

▬ 5322 390 10096 Oil
4822 390 20154 Grease

Cleaning set:
4822 390 80166 Isopropanol
4822 466 91591 Cleaning cloth

10.5 Mechanical parts list

Pos.	Description	KITS								Code number
		B	I	L	P	Q	S	T	U	4822
1	Rec. protection lever (with spring)									402 10202
2	Chassis mounting spring (2x)									492 71022
5	Main brake left				P					
6	Main brake spring (2x)				P					
9	Damping roller *)									528 70782
10	Main brake right				P					
11	Tension arm spring									492 33317
12	Tension crank									403 70551
13	Slip ring								U	
14	Tension band				P					
15	Tension arm									403 70547
16	Erase head									249 10522
17	Swivelling gear								U	
18	Brake gear (2x)								U	
19	Swivelling plate								U	
20	Reel table (S)								U	
20a	Reel table (T)								U	
21	Headamplifier holder							T		
22	Bracket							T		
23	Roller unit left									528 70771
24	Loading arm left	B								
25	Loading arm right	B								
26	Roller unit right									528 70772
27	Loading gear	B								
30	Reverse clip					Q				
31	Reverse lever					Q				
32	Intermediate lever					Q				
34	Scanner assy. 2/0 (Head disc and motor)									4803 218 00011
34	Scanner assy. 2/0-LP (Head disc and motor)									4803 218 00021
34	Scanner assy. 4/0 (Head disc and motor)									4803 218 00031
34	Scanner assy. 4/2 (Head disc and motor)									4803 218 00041
35	Cleaning roller									528 70773
36	A/C Head (with clip and screws)									249 10468
37	Pressure roller (with spring)									528 70774
38	Threading motor									361 10809
39	Threading belt									358 20421
40	Motor holder							T		
41	Pressure roller guide						S			
42	Reverse brake				P					
44	Slider gear	B					S			
45	Cam wheel						S			
46	Cam shaft						S			
47	Pulley shaft									528 81462
48	Worm shaft						S			
49	Chassis mounting clip							T		
50	WD-holder							T		

Pos.	Description	KITS								Code number
		B	I	L	P	Q	S	T	U	4822
101	Cassette loader trigger			L						
102	Clip			L						
103	Cassette loader gear1			L						
104	Cassette loader spring			L						
105	Cassette loader gear2			L						
106	Spindle									535 93277
111	Cam wheel reverse	B								
112	Tension lever							T		
113	Cam wheel tension	B								
114	Clutch lever (with spring)									403 70549
115	Clutch									528 20736
116	Changing gear		I							
117	Double gear		I							
118	Light prism							T		
119	Init flap and holder							T		
120	Cam wheel lever							T		
121	S-VHS lever							T		
122	Prism rihgt							T		
123	Prism left							T		
125	Main slider							T		
126	Driving belt									358 31166
127	Capstan motor (with screws)									361 10805
129	Reverse kicker with transmission gears *)									522 20451
128	Gear pulley		I							
150	Lift									443 64112
KIT	B									310 31955
KIT	I									310 31963
KIT	L									310 32116
KIT	P									310 32191
KIT	Q									310 10658
KIT	S									310 10661
KIT	T									310 10662
KIT	U						3103			109 09190

*) optional

Um eine hohen Reparaturstandard zu gewährleisten sind mit Ausnahme von Kit T immer alle im Kit enthaltenen Teile zu tauschen.

In order to guarantee a high repairstandard all spare parts included in a kit have to be replaced with the exception of kit T.

Per una riparazione garantita ocorre sostituire tutti i pezzi contenuti nei kit, fatta eccetione per il kit T.

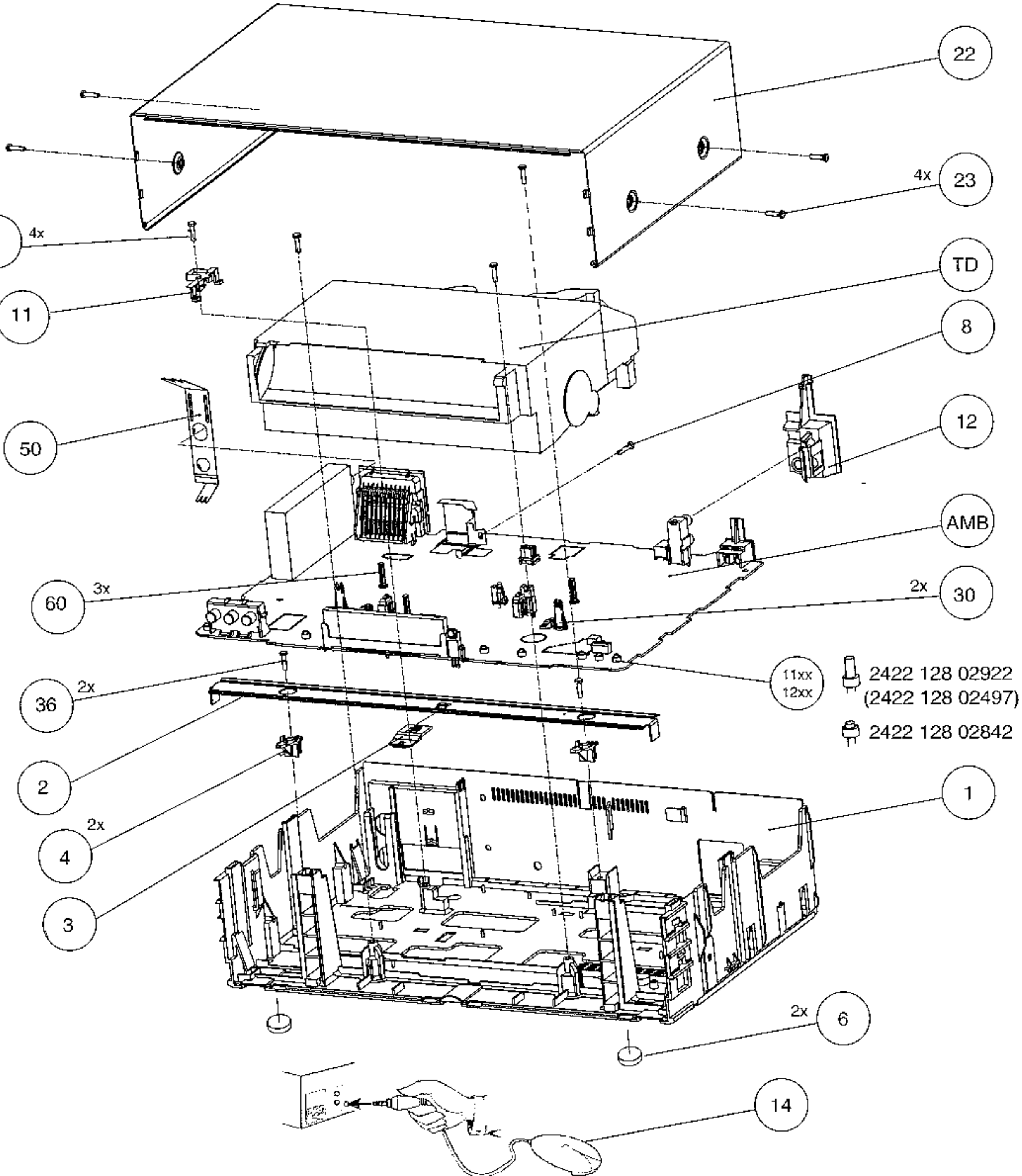
Para obtener un estandár de reparaciones elevado,es necesario cambiar todas las partes contenidas en el kit, la única exceptión es para el kit T.

A fin d'obtenir un standard de réparations élevé, toutes les pièces de rechange incluses dans un kit sont à remplacer, exception faite du kit T.

Om een hoge reparatiekwaliteit te waarbogen moeten, met uitzondering van kit T, altijd alle zich in een kit bevindende onderdelen worden vervangen.

11. Exploded views

11.1 Exploded view set


22
4x
23
7
4x
TD
11
8
12
50
AMB
60
3x
2x
30
11xx
12xx
2422 128 02922
(2422 128 02497)
2422 128 02842
36
2x
2
1
2x
4
3
2x
6
14

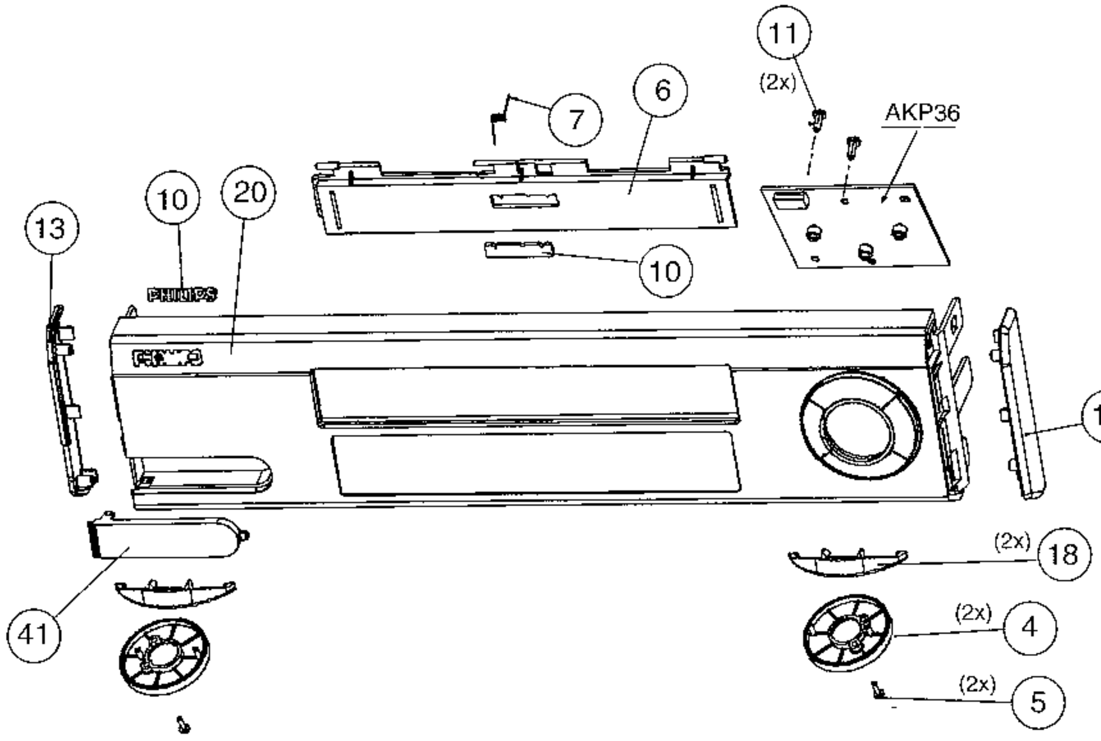
11.2 Set Parts List

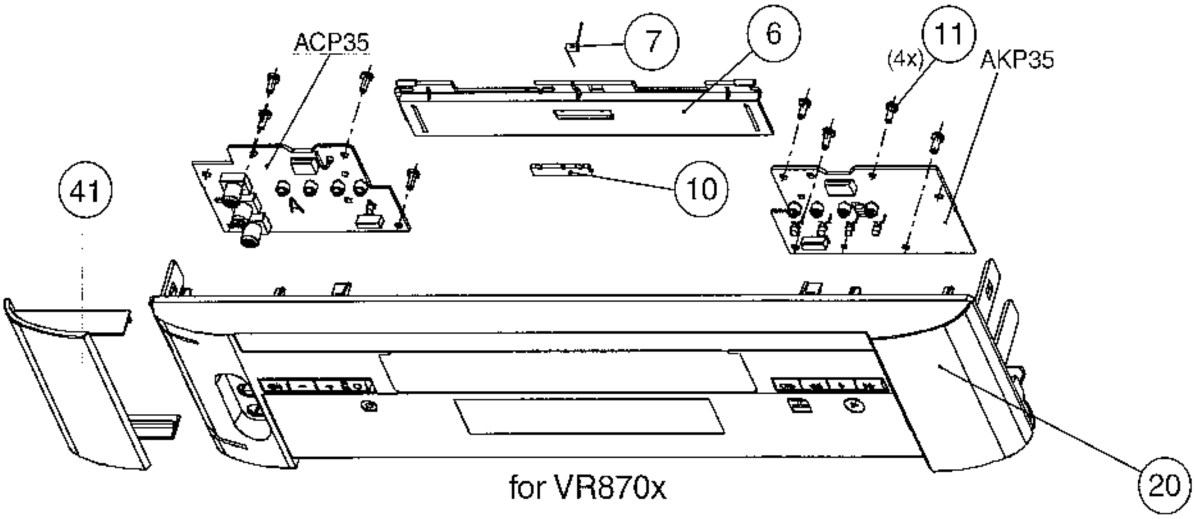
Pos	Service Code	Description
1	3103 138 92410	FRAME ASSY 2SCART 435 mm sets
	3103 138 90120	FRAME ASSY STEREO 380 mm sets
	3103 138 91710	FRAME ASSY 2SCART 380 mm sets
	3103 138 91700	FRAME ASSY 1SCART 380 mm sets
2	3103 141 22800	BRACKET 380 mm sets
	3103 141 23740	BRACKET 435 mm sets
3	3103 104 20960	SNAP CATCH
6	3103 184 00830	FOOT
7	3103 100 42400	SCREW 3,5X16
8	3103 100 42530	SCREENING SCREW
11	3103 104 01530	WD-HOLDER
12	3103 104 25950	CINCH COVER
	3103 104 25890	CINCH COVER SAT
14	8622 666 10101	VCR SAT MOUSE
22	3103 141 23810	COVER VR120, 402, 520
	3103 141 23680	COVER VR170, 220, 270x, 420, 57x, 620, 622, 670x
	3103 141 23790	COVER VR720, VR870x
	3103 141 23590	COVER VR627
	3103 141 23070	COVER SBx, xxDV30
23	3103 100 42640	SCREW 3,5X10 SILVER
	3112 400 40220	SCREW 3,5X10 BLACK
30	3103 107 61760	DISTANCE HOLDER DECK
36	2511 076 50014	SCREW 3X12
50	3103 111 02560	SPRING
60	3103 104 20110	DISTANCE HOLDER MOBO

Service Code	Description Control Panel pos 20
3103 138 92280	CONTROL PANEL VR120
3103 138 92420	CONTROL PANEL VR170/02/58
3103 138 92730	CONTROL PANEL VR170/07
3103 138 92620	CONTROL PANEL VR170/39
3103 138 92640	CONTROL PANEL VR220/02/58
3103 138 92650	CONTROL PANEL VR220/07
3103 138 92660	CONTROL PANEL VR220/39
3103 138 92690	CONTROL PANEL VR270B/02/07/58
3103 138 92290	CONTROL PANEL VR270B/39
3103 138 92720	CONTROL PANEL VR270W/02/07/58
3103 138 92740	CONTROL PANEL VR270W/39
3103 138 92770	CONTROL PANEL VR402/58
3103 138 92780	CONTROL PANEL VR420/02/58
3103 138 92790	CONTROL PANEL VR420/39
3103 138 92830	CONTROL PANEL VR520/02
3103 138 92840	CONTROL PANEL VR520/07
3103 138 92850	CONTROL PANEL VR520/16/58
3103 138 92880	CONTROL PANEL VR570/02
3103 138 92890	CONTROL PANEL VR570/07
3103 138 92950	CONTROL PANEL VR570/16/58
3103 138 92910	CONTROL PANEL VR570/39
3103 138 92870	CONTROL PANEL VR572/02
3103 138 92900	CONTROL PANEL VR572/16
3103 138 92340	CONTROL PANEL VR620/02
3103 138 93030	CONTROL PANEL VR620/07
3103 138 93040	CONTROL PANEL VR620/16/58
3103 138 93050	CONTROL PANEL VR620/39
3103 138 92920	CONTROL PANEL VR622/02
3103 138 93000	CONTROL PANEL VR622/16
3103 138 93060	CONTROL PANEL VR627/02
3103 138 93070	CONTROL PANEL VR627/16
3103 138 92930	CONTROL PANEL VR670B/02/16/58
3103 138 92940	CONTROL PANEL VR670B/07
3103 138 92960	CONTROL PANEL VR670B/39
3103 138 92980	CONTROL PANEL VR670W/02/16/58
3103 138 92990	CONTROL PANEL VR670W/07
3103 138 93010	CONTROL PANEL VR670W/39
3103 138 93090	CONTROL PANEL VR720/02
3103 138 93100	CONTROL PANEL VR720/07
3103 138 92190	CONTROL PANEL VR720/16/58
3103 138 93110	CONTROL PANEL VR720/39
3103 138 92630	CONTROL PANEL VR870CC/02/16/58
3103 138 92670	CONTROL PANEL VR870CC/07
3103 138 92680	CONTROL PANEL VR870CC/39
3103 138 92210	CONTROL PANEL VR870L/02/16/58
3103 138 93130	CONTROL PANEL VR870L/07
3103 138 93140	CONTROL PANEL VR870L/39
3103 138 93170	CONTROL PANEL SB140/03
3103 138 93200	CONTROL PANEL SB140/38
3103 138 93180	CONTROL PANEL SB145/03
3103 138 93250	CONTROL PANEL SB145/11
3103 138 93260	CONTROL PANEL SB445/11
3103 138 93220	CONTROL PANEL SB445/38
3103 138 93190	CONTROL PANEL SB645/03
3103 138 93270	CONTROL PANEL SB645/11
3103 138 93230	CONTROL PANEL SB645/38
3103 138 92300	CONTROL PANEL SB745/03
3103 138 93280	CONTROL PANEL SB745/11
3103 138 93240	CONTROL PANEL SB745/38
3103 138 93290	CONTROL PANEL 20DV30/39
3103 138 93300	CONTROL PANEL 45DV30/39
3103 138 93310	CONTROL PANEL 65DV30/39

Service Code	Description Lift Flap pos 6
3103 178 33150	LIFT FLAP VR120
3103 178 33250	LIFT FLAP VR170/02/07/58
3103 178 35090	LIFT FLAP VR170/39
3103 178 33300	LIFT FLAP VR220
3103 178 33370	LIFT FLAP VR270x, VR670x
3103 178 33520	LIFT FLAP VR402/58
3103 178 33330	LIFT FLAP VR420
3103 178 33870	LIFT FLAP VR520/02
3103 178 33550	LIFT FLAP VR520/07/16/58
3103 178 34790	LIFT FLAP VR570/02
3103 178 33920	LIFT FLAP VR570/07/16/58
3103 178 34970	LIFT FLAP VR570/39
3103 178 35340	LIFT FLAP VR572/02
3103 178 35350	LIFT FLAP VR572/16
3103 178 33900	LIFT FLAP VR620/07/16/39/58, VR622/16
3103 178 34510	LIFT FLAP VR627/02
3103 178 34720	LIFT FLAP VR627/16
3103 178 33600	LIFT FLAP VR62x/02
3103 178 33020	LIFT FLAP VR720/02
3103 178 34040	LIFT FLAP VR720/07/16/39/58
3103 178 34310	LIFT FLAP VR870x
3103 178 33660	LIFT FLAP SB140/03
3103 178 34780	LIFT FLAP SB140/38
3103 178 33680	LIFT FLAP SB145/03
3103 178 33690	LIFT FLAP SB145/11
3103 178 34060	LIFT FLAP SB445/11
3103 178 34800	LIFT FLAP SB445/38
3103 178 34160	LIFT FLAP SB645/03
3103 178 34810	LIFT FLAP SB645/11
3103 178 34980	LIFT FLAP SB645/38
3103 178 33730	LIFT FLAP SB745/03
3103 178 34820	LIFT FLAP SB745/11
3103 178 35110	LIFT FLAP SB745/38
3103 178 34430	LIFT FLAP 20DV30/39
3103 178 34570	LIFT FLAP 45DV30/39
3103 178 34590	LIFT FLAP 65DV30/39

11.3 Front Parts List





for VR870x

Pos	Service code	Description
4	3103 178 29460	FOOT
5	2511 076 50014	SCREW 3X12
7	3103 111 02450	LEG SPRING
10	3103 110 01560	WORDMARK VR120, 402,520
	3103 110 01570	WORDMARK VR170,270x,57x,670x
	3103 110 01550	WORDMARK VR220,420,62x,720
	3103 110 01580	WORDMARK VR870x
11	2511 076 50012	SCREW 3X8
12	3103 104 27640	SIDE CAP RIGHT VR620, 622
	3103 178 34250	SIDE CAP RIGHT VR627
13	3103 104 27630	SIDE CAP LEFT VR620, 622
	3103 178 34260	SIDE CAP LEFT VR627

Pos	Service code	Description
18	3103 178 34270	FOOT VR627
	3103 104 27650	FOOT VR620, 622
41	3103 178 34170	AV-COVER **FR** VR620, 622
	3103 178 33700	AV-COVER **GB** VR620, 622
	3103 178 34200	AV-COVER **GB** VR627
	3103 178 33080	AV-COVER **GB** VR720
	3103 178 34690	AV-COVER **FR** VR720
	3103 178 34300	CINCH DOOR VR870x
	3103 198 89270	ACP35/AKP35 CONN / KEY PRINT
	3103 198 89280	AKP36 KEYPRINT

12. Spare parts list

MOBO

Various

0005	3103 104 25900	DISPLAY HOLDER
0007	3103 107 61690	TACHO HOLDER
0008	3103 107 61840	TACHO HOLDER
0020	3103 150 12050	SENSORHOLDER
0021	3103 107 61680	SENSORHOLDER
0022	3103 150 12050	SENSORHOLDER
1001	2422 543 01125	CRYSTAL 4.43MHz
1101	2422 128 02497	SWITCH long
1101	2422 128 02922	SWITCH long
1105	2422 128 02497	SWITCH
1108	2422 128 02497	SWITCH
1109	2422 128 02842	SWITCH short
1118	2422 128 02842	SWITCH
1119	2422 128 02497	SWITCH
1119	2422 128 02922	SWITCH
1122	2422 128 02842	SWITCH
1123	2422 128 02497	SWITCH
1123	2422 128 02922	SWITCH
1125	2422 128 02497	SWITCH
1125	2422 128 02922	SWITCH
1127	2422 128 02497	SWITCH
1127	2422 128 02842	SWITCH
1127	2422 128 02922	SWITCH
1152	2422 128 02497	SWITCH
1152	2422 128 02922	SWITCH
1153	2422 128 02497	SWITCH
1153	2422 128 02922	SWITCH
1156	2422 128 02497	SWITCH
1157	2422 128 02842	SWITCH
1157	2422 128 02497	SWITCH
1157	2422 128 02922	SWITCH
1158	2422 128 02922	SWITCH
1158	2422 128 02497	SWITCH
1160	2422 128 02497	SWITCH
1163	2422 128 02842	SWITCH
1163	2422 128 02497	SWITCH
1163	2422 128 02922	SWITCH
1170	2422 543 00056	CRYSTAL 32.768kHz
1171	2422 543 00761	CRYSTAL 16MHz
1201	2422 128 02842	SWITCH
1203	2422 128 02497	SWITCH
1204	2422 128 02922	SWITCH
1204	2422 128 02497	SWITCH
1205	2422 128 02497	SWITCH
1205	2422 128 02922	SWITCH
1209	2422 128 02922	SWITCH
1209	2422 128 02497	SWITCH
1213	2422 128 02497	SWITCH
1213	2422 128 02922	SWITCH
1213	2422 128 02842	SWITCH
1216	2422 128 02497	SWITCH
1217	2422 128 02497	SWITCH
1217	2422 128 02842	SWITCH
1217	2422 128 02922	SWITCH
1221	2422 128 02497	SWITCH
1222	2422 128 02842	SWITCH
1222	2422 128 02497	SWITCH
1222	2422 128 02922	SWITCH
1253	2422 128 02497	SWITCH
1253	2422 128 02922	SWITCH
1300▲	3103 100 23910	MAINS PLUG
1301▲	3103 138 86490	FUSE T1.25A
1302▲	2422 549 43073	SURGE PROTECT
1304▲	2422 086 10919	PROT 125mA
1306▲	2422 086 10956	PROT 1.6A
1308▲	2422 086 10955	PROT 1.25A
1309▲	2422 086 10514	FUSE T100mA
1501▲	2422 086 10919	PROT 125mA
1701	3112 297 12180	TUMOD TP926 MK2 BOOSTER
1702	2422 542 90081	TUMOD TCBZ4-002A BG/I/DK
1703	2422 549 44341	OFWK9656M PAL/SEC
1704	2422 549 42273	OFWJ1980M PAL I
1704	2422 549 42068	OFWG3956M SEC/NIC
1704	2422 549 41518	OFWG1961M PAL/MONO
1704	2422 549 41801	OFWG1984M PAL/STEREO
1704	9322 042 72682	OFWK3953M PALI/SECAM
1704	2422 549 42004	OFWK2955M for K1
1705	2422 549 42391	FILTER TPW 6,0/6,5MHz PAL I
1705	2422 549 41595	FILTER 5.5MHz PAL BG
1705	2422 549 41433	FILTER 6.5MHz SEC
1706	2422 549 42824	FILTER 5,5MHz PAL BG
1706	2422 549 42825	FILTER 6,0MHz PAL I
1706	2422 549 42826	FILTER 6,5MHz SEC
1707	2422 549 42826	FILTER 6,5MHz SEC
1707	2422 549 42825	FILTER 6,0MHz PAL I
1760	2422 543 01119	CRYSTAL 4MHz
1761	2422 543 00781	CRYSTAL 18.432MHz
1766	2422 549 42826	FIL CER 6MHz 5 EFCT-YS5 KB
1801	3103 107 90110	SWITCH ASSY
1802	3103 107 90110	SWITCH ASSY
1911	2422 025 14521	CONNECTOR 11 PIN
1912	2422 025 16933	CONNECTOR 9 PIN
1941	2422 026 04294	PHONES CONNECTOR
1946	3103 107 20720	CAPSTAN CONNECT
1947	2422 025 14512	CONNECTOR 3 PIN
1948	2422 025 14515	CONNECTOR 6 PIN
1951	3103 100 24010	SCART SOCKET 7133
1952	3103 100 24210	SCART SOCKET 7135
1954	3103 100 24250	TRIPLE PIN JACK
1955	2422 025 14515	CONNECTOR 6 PIN
1956	2422 026 05087	CINCH CONNECTOR
1961	2422 025 09405	CONNECTOR 2 PIN
1965	2422 025 14516	CONNECTOR 7 PIN
1969	2422 025 14532	CONNECTOR 3 PIN
1982	2422 025 16742	CONNECTOR 8 PIN

⊣⊢

2000	3198 023 41040	100 nF 25V
2001	3198 017 31030	10 nF 50V
2002	3198 017 31030	10 nF 50V
2003	3198 029 31090	10 µF 25V
2004	3198 017 31030	10 nF 50V
2005	3198 023 41040	100 nF 25V
2006	3198 029 31090	10 µF 25V
2007	3198 017 01030	10 nF 50V
2008	3198 017 32230	22 nF 25V
2009	3198 017 21050	1 µF 16V
2010	3198 017 21050	1 µF 16V
2011	3198 017 32230	22 nF 25V
2012	3198 017 31030	10 nF 50V
2013	3198 017 31030	10 nF 50V
2014	3198 024 44730	47 nF 50V
2015	3198 017 31030	10 nF 50V
2016	3198 017 31030	10 nF 50V
2017	3198 017 21050	1 µF 16V
2018	3198 023 41040	100 nF 25V
2019	3198 029 31090	10 µF 25V
2020	3198 029 31090	10 µF 25V
2021	3198 017 01040	100 nF 16V
2022	3198 029 31090	10 µF 25V
2023	3198 017 21050	1 µF 16V
2024	3198 029 04790	47 µF 6.3V
2025	3198 017 31030	10 nF 50V
2026	3198 023 41040	100 nF 25V
2027	3198 017 21050	1 µF 16V
2028	3198 017 01040	100 nF 16V
2029	3198 023 41040	100 nF 25V
2030	3198 017 31030	10 nF 50V
2031	3198 017 24740	470 nF 16V
2032	3198 016 32790	27 pF 50V
2033	3198 017 31030	10 nF 50V
2034	3198 017 31020	1 nF 50V
2035	3198 029 22290	22 µF 16V
2036	3198 029 31090	10 µF 25V
2037	3198 017 21050	1 µF 16V
2038	3198 023 21040	100 nF 25V
2039	3198 017 21050	1 µF 16V
2040	3198 017 31030	10 nF 50V
2041	3198 025 54780	4.7 µF 50V
2042	3198 017 31040	100 nF 16V
2043	3198 029 31090	10 µF 25V
2044	3198 017 21040	100 nF 50V
2045	3198 017 01040	100 nF 16V
2046	3198 017 32210	220 pF 50V
2047	3198 016 04780	4.7 pF 50V
2048	2022 552 05334	180 pF 50V
2049	3198 017 31030	10 nF 50V
2050	3198 016 32290	22 pF 50V
2051	2238 861 14391	390 pF 50V
2052	3198 016 33310	330 pF 50V
2053	3198 017 31030	10 nF 50V
2054	3198 017 31030	10 nF 50V
2055	3198 016 32790	27 pF 50V
2056	3198 016 34790	47 pF 50V
2071	3198 017 31030	10 nF 50V
2072	3198 016 31510	150 pF 50V
2073	3198 029 21010	100 µF 16V
2074	2022 552 05335	220 pF 50V
2075	3198 017 31030	10 nF 50V
2076	3198 023 41040	100 nF 25V
2077	3198 017 31040	100 nF 16V
2079	3198 016 38290	82 pF 50V
2080	3198 016 31010	100 pF 50V
2082	3198 017 31030	10 nF 50V
2083	3198 017 31030	10 nF 50V
2084	3198 029 31090	10 µF 25V
2085	3198 017 24740	470 nF 16V
2086	3198 017 31030	10 nF 50V
2087	3198 016 36810	680 pF 25V
2088	3198 017 21050	1 µF 16V
2089	3198 017 32230	22 nF 25V
2090	3198 016 32210	220 pF 50V
2096	3198 017 31040	100 nF 16V
2097	3198 016 31090	10 pF 50V
2170	3198 029 04790	47 µF 6.3V
2171	3198 023 21040	100 nF 25V
2173	3198 023 21040	100 nF 25V
2174	2020 025 90019	220 mF 5.5V
2175	3198 016 31890	18 pF 50V
2176	3198 016 31590	15 pF 50V
2177	3198 016 02290	22 pF 50V
2178	3198 016 32290	22 pF 50V
2179	3198 017 24740	470 nF 16V
2180	3198 017 31030	10 nF 50V
2181	3198 023 41040	100 nF 25V
2182	3198 029 24790	47 µF 16V
2300	3198 017 31040	100 nF 16V
2301	3198 025 51090	10 µF 50V
2302	2020 558 90442	47 pF 2kV
2303	3198 017 33320	3.3 nF 50V
2304	2020 558 90442	47 pF 2kV
2305	2020 021 91536	330 µF 16V
2308	2022 318 00108	47 nF 250V
2309	2020 021 91332	47 µF 50V
2310	2020 021 91529	22 µF 50V
2311	2020 021 91527	100 µF 10V
2312	2020 021 91528	560 µF 6.3V
2313	3198 025 01020	1000 µF 6.3V
2314	3198 023 21040	100 nF 25V
2315	3198 017 31030	10 nF 50V
2316▲	2022 330 00014	100 nF 275V
2317▲	2020 554 90127	2.2 nF 250V
2318▲	2020 021 91525	18 µF 385V
2319	3198 025 51090	10 µF 50V
2325	3198 017 31030	10 nF 50V
2327	3198 017 31040	100 nF 16V
2328	2238 910 15649	100 nF 25V
2459	3198 017 32230	22 nF 25V
2460	2022 552 05448	150 nF 50V
2461	3198 029 21010	100 µF 16V
2462	2022 020 00625	220 µF 16V
2463	3198 017 21040	100 nF 50V
2464	3198 023 41040	100 nF 25V
2465	3198 017 34730	47 nF 16V
2466	3198 017 34730	47 nF 16V
2467	3198 017 34730	47 nF 16V
2468	2022 552 05236	5.6 nF 50V
2469	3198 017 31040	100 nF 16V
2470	3198 029 21010	100 µF 16V
2471	3198 017 31040	100 nF 16V
2472	3198 017 02230	22 nF 50V
2473	3198 017 01030	10 nF 50V
2474	3198 017 21040	100 nF 50V
2475	3198 016 01010	100 pF 50V
2476	3198 017 01040	100 nF 16V
2477	3198 017 33330	33 nF 16V
2479	3198 017 34720	4.7 nF 50V
2480	3198 017 02220	2.2 nF 50V
2481	3198 029 24790	47 µF 16V
2482	3198 017 21040	100 nF 50V
2483	3198 017 31030	10 nF 50V
2484	3198 017 31030	10 nF 50V
2485	3198 023 41040	100 nF 25V
2486	3198 017 04720	4.7 nF 50V
2487	3198 025 31010	100 µF 25V
2488	3198 029 31090	10 µF 25V
2490	3198 025 31010	100 µF 25V
2500	3198 029 02210	220 µF 6.3V
2501	3198 023 41040	100 nF 25V
2502	3198 023 41040	100 nF 25V
2503	3198 023 41040	100 nF 25V
2504	3198 017 24740	470 nF 16V
2505	3198 017 34730	47 nF 16V
2506	2238 910 15649	100 nF 25V
2507	3198 016 31210	120 pF 50V
2509	3198 017 31020	1 nF 50V

2530	3198 023 41040	100 nF 25V
2531	3198 029 31090	10 µF 25V
2532	3198 017 32220	2.2 nF 50V
2533	3198 017 32220	2.2 nF 50V
2534	3198 016 31810	180 pF 50V
2535	3198 016 31810	180 pF 50V
2536	3198 017 21050	1 µF 16V
2537	3198 017 21050	1 µF 16V
2601	3198 023 41040	100 nF 25V
2602	3198 029 22290	22 µF 16V
2603	3198 029 24790	47 µF 16V
2604	3198 023 41040	100 nF 25V
2605	3198 023 41040	100 nF 25V
2606	3198 023 41040	100 nF 25V
2607	3198 029 24790	47 µF 16V
2608	3198 017 31030	10 nF 50V
2609	3198 029 24790	47 µF 16V
2610	3198 029 31090	10 µF 25V
2611	3198 023 41040	100 nF 25V
2612	3198 017 21050	1 µF 16V
2613	3198 029 31090	10 µF 25V
2614	3198 023 21040	100 nF 25V
2615	3198 016 33310	330 pF 50V
2616	3198 017 31020	1 nF 50V
2617	3198 017 32220	2.2 nF 50V
2618	3198 017 34730	47 nF 16V
2619	2022 552 05341	820 pF 50V
2620	3198 029 24790	47 µF 16V
2621	3198 017 31030	10 nF 50V
2623	3198 016 31020	1 nF 25V
2624	3198 029 21010	100 µF 16V
2625	2020 300 90611	27 nF 50V
2626	3198 017 34720	4.7 nF 50V
2627	2022 552 05234	3.9 pF 50V
2628	3198 029 22290	22 µF 16V
2630	3198 017 31030	10 nF 50V
2631	3198 017 32220	2.2 nF 50V
2632	3198 017 21050	1 µF 16V
2633	3198 029 31090	10 µF 25V
2650	3198 029 31090	10 µF 25V
2651	3198 029 31090	10 µF 25V
2652	3198 023 41040	100 nF 25V
2653	3198 017 36820	6.8 nF 50V
2654	3198 017 31030	10 nF 50V
2655	3198 029 24790	47 µF 16V
2656	3198 029 31090	10 µF 25V
2657	3198 017 42240	220 nF 16V
2658	3198 017 42240	220 nF 16V
2659	3198 017 42240	220 nF 16V
2660	3198 029 52280	2.2 µF 50V
2661	3198 017 42240	220 nF 16V
2662	3198 017 42240	220 nF 16V
2663	3198 029 52280	2.2 µF 50V
2664	3198 017 42240	220 nF 16V
2665	3198 017 42240	220 nF 16V
2666	3198 017 42240	220 nF 16V
2667	3198 017 22250	2.2 µF 10V
2668	3198 017 22250	2.2 µF 10V
2669	3198 023 21040	100 nF 25V
2670	3198 017 42240	220 nF 16V
2671	3198 029 31090	10 µF 25V
2672	3198 029 52280	2.2 µF 50V
2673	3198 029 21010	100 µF 16V
2674	3198 017 32230	22 nF 25V
2675	3198 029 24790	47 µF 16V
2676	3198 017 21050	1 µF 16V
2678	3198 017 31040	100 nF 16V
2679	3198 029 31090	10 µF 25V
2680	3198 017 36820	6.8 nF 50V
2681	3198 029 04790	47 µF 6.3V
2700	3198 016 31090	10 pF 50V
2701	2020 021 91355	2.2 µF 50V
2702	3198 023 21040	100 nF 25V
2703	3198 029 22290	22 µF 16V
2704	3198 016 34710	470 pF 50V
2705	3198 017 31030	10 nF 50V
2706	3198 029 31090	10 µF 25V
2707	3198 023 21040	100 nF 25V
2708	3198 017 42240	220 nF 16V
2709	2020 552 94914	8.2 pF 50V
2710	3198 023 41040	100 nF 25V
2712	3198 017 01020	1 nF 50V
2713	3198 016 31210	120 pF 50V
2714	3198 016 32210	220 pF 50V
2715	3198 029 52280	2.2 µF 50V
2718	3198 017 32230	22 nF 25V
2719	3198 029 22290	22 µF 16V
2720	2020 021 91527	100 µF 10V
2721	3198 023 41040	100 nF 25V
2722	3198 016 34710	470 pF 50V
2723	3198 023 41040	100 nF 25V
2724	3198 017 31030	10 nF 50V
2725	3198 017 21040	100 nF 50V
2726	3198 029 52280	2.2 µF 50V
2727	3198 016 31010	100 pF 50V
2728	3198 016 31010	100 pF 50V
2760	3198 017 33320	3.3 nF 50V
2761	3198 017 31040	100 nF 16V
2763	3198 016 36810	680 pF 25V
2764	3198 017 31030	10 nF 50V
2765	3198 017 31040	100 nF 16V
2766	3198 029 31090	10 µF 25V
2767	3198 017 31030	10 nF 50V
2768	3198 029 31090	10 µF 25V
2769	3198 029 31090	10 µF 25V
2770	3198 017 24740	470 nF 16V
2771	3198 016 34790	47 pF 50V
2772	3198 016 36810	680 pF 25V
2773	3198 017 33320	3.3 nF 50V
2775	3198 017 31030	10 nF 50V
2776	3198 025 54780	4.7 µF 50V
2778	3198 017 24740	470 nF 16V
2779	3198 017 24740	470 nF 16V
2780	2022 552 05344	4.7 nF 50V
2781	3198 017 24740	470 nF 16V
2782	3198 029 24790	47 µF 16V
2783	3198 017 31040	100 nF 16V
2784	3198 016 34790	47 pF 50V
2785	3198 017 24740	470 nF 16V
2786	3198 017 24740	470 nF 16V
2787	3198 016 33380	3.3 pF 50V
2788	3198 016 33380	3.3 pF 50V
2789	3198 017 31030	10 nF 50V
2790	3198 029 31090	10 µF 25V
2791	3198 017 31030	10 nF 50V
2792	3198 016 34790	47 pF 50V
2793	3198 017 31020	1 nF 50V
2794	3198 017 31020	1 nF 50V
2795	3198 016 31590	15 pF 50V
2800	3198 017 31040	100 nF 16V
2801	3198 016 32210	220 pF 50V
2802	3198 017 32220	2.2 nF 50V
2803	3198 025 32210	220 µF 25V
2805	3198 017 32220	2.2 nF 50V
2809	3198 029 21010	100 µF 16V
2812	3198 016 33390	33 pF 50V
2814	3198 016 36890	68 pF 50V
2815	3198 016 36890	68 pF 50V
2901	3198 017 31040	100 nF 16V
2902	3198 029 24790	47 µF 16V
2903	3198 029 31090	10 µF 25V
2904	3198 029 31090	10 µF 25V
2905	3198 023 41040	100 nF 25V
2906	3198 016 32290	22 pF 50V
2907	3198 023 41040	100 nF 25V
2908	3198 029 31090	10 µF 25V
2909	3198 023 21040	100 nF 25V
2910	3198 023 41040	100 nF 25V
2911	3198 023 41040	100 nF 25V
2912	3198 023 21040	100 nF 25V
2913	3198 023 41040	100 nF 25V
2914	3198 023 41040	100 nF 25V
2916	3198 016 34710	470 pF 50V
2917	3198 016 04710	470 pF 50V
2918	3198 017 04710	470 pF 50V
2919	3198 016 34710	470 pF 50V
2920	3198 017 04710	470 pF 50V
2921	3198 016 34710	470 pF 50V
2922	3198 029 31090	10 µF 25V
2923	3198 029 02210	220 µF 6.3V
2924	3198 016 36890	68 pF 50V
2926	3198 016 31010	100 pF 50V
2927	3198 016 01010	100 pF 50V
2930	3198 017 31020	1 nF 50V
2931	3198 017 31020	1 nF 50V
2932	3198 016 01010	100 pF 50V
2933	3198 016 31010	100 pF 50V

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3000	3198 021 32220	2.2 k 0.063W
3001	3198 021 31520	1.5 k 0.063W
3002	3198 011 01820	1.8 k 0.17W
3003	3198 021 32220	2.2 k 0.063W
3004	3198 021 31020	1 k 0.063W
3005	3198 021 31020	1 k 0.063W
3006	3198 021 38220	8.2 k 0.063W
3007	3198 021 33920	3.9 k 0.063W
3008	3198 021 32250	2.2 M 0.063W
3009	2120 108 91451	1 k 0.1W
3010	3198 021 31020	1 k 0.063W
3011	3198 021 31010	100 R 0.063W
3012	3198 021 51010	100 R 0.1W
3013	3198 011 03910	390 R 0.17W
3014	3198 021 33920	3.9 k 0.063W
3015	3198 021 33910	390 R 0.063W
3016	2120 108 92621	2.7 k 1%
3017	2120 108 92618	1.8 k 1%
3018	3198 021 31020	1 k 0.063W
3019	2322 156 26801	680 R 1%
3020	2322 704 64702	4.7 k 0.063W
3021	3198 021 31510	150 R 0.063W
3022	3198 011 01020	1 k 0.17W
3023	3198 021 34730	47 k 0.063W
3024	3198 011 04730	47 k 0.17W
3025	3198 021 32210	220 R 0.063W
3026	3198 021 31050	1 M 0.063W
3027	3198 021 51080	1 R
3028	3198 021 31510	150 R 0.063W
3029	3198 021 31050	1 M 0.063W
3030	3198 021 33330	33 k 0.063W
3031	3198 021 52250	2.2 M 0.1W
3032	3198 021 36810	680 R 0.063W
3070	3198 021 31020	1 k 0.063W
3071	3198 011 04730	47 k 0.17W
3072	3198 021 31520	1.5 k 0.063W
3073	3198 021 38220	8.2 k 0.063W
3074	2120 108 92514	15 k 1%
3075	3198 021 31040	100 k 0.063W
3076	3198 021 31030	10 k 0.063W
3078	3198 021 31830	18 k 0.063W
3079	3198 021 36810	680 R 0.063W
3082	3198 011 03320	3.3 k 0.17W
3083	3198 021 31020	1 k 0.063W
3084	3198 021 32230	22 k 0.063W
3085	3198 021 32730	27 k 0.063W
3086	3198 021 32720	2.7 k 0.063W
3087	3198 021 31030	10 k 0.063W
3088	2120 368 90124	22 k POT
3089	2120 368 90119	1 k POT
3091	3198 021 38220	8.2 k 0.063W
3092	3198 011 04730	47 k 0.17W
3094	3198 021 31230	12 k 0.063W
3095	3198 021 36810	680 R 0.063W
3108	3198 021 54730	47 k 0.1W
3108	3198 021 34730	47 k 0.063W
3110	3198 021 34730	47 k 0.063W
3112	3198 021 31040	100 k 0.063W
3112	3198 021 51040	100 k 0.1W
3115	3198 021 31040	100 k 0.063W
3115	3198 021 34710	470 R 0.063W
3116	3198 021 34730	47 k 0.063W
3119	3198 021 31040	100 k 0.063W
3119	3198 021 31080	1 R 0.063W
3120	3198 021 31080	1 R 0.063W
3120	3198 021 34710	470 R 0.063W
3135	3198 021 33920	3.9 k 0.063W
3135	3198 021 31080	1 R 0.063W
3136	3198 021 31080	1 R 0.063W
3140	3198 021 35620	5.6 k 0.063W
3140	3198 021 34710	470 R 0.063W
3140	3198 021 32220	2.2 k 0.063W
3140	3198 021 31080	1 R 0.063W
3141	3198 021 34710	470 R 0.063W
3142	3198 021 38220	8.2 k 0.063W
3142	3198 021 31830	18 k 0.063W
3146	3198 021 34730	47 k 0.063W
3150	3198 021 31830	18 k 0.063W
3152	3198 021 31830	18 k 0.063W
3154	3198 021 31830	18 k 0.063W
3157	3198 021 33920	3.9 k 0.063W
3159	3198 021 38220	8.2 k 0.063W
3161	3198 021 38220	8.2 k 0.063W
3163	3198 021 35620	5.6 k 0.063W
3170▲	2120 106 90603	470 R
3171	3198 021 31830	18 k 0.063W
3172	3198 021 32210	220 R 0.063W
3173	3198 021 31080	1 R 0.063W
3174	3198 021 34730	47 k 0.063W
3175	3198 021 31030	10 k 0.063W
3176	3198 021 31080	1 R 0.063W
3300	2120 108 92624	4.7 k 1%
3302	3198 011 02210	220 R 0.17W
3303	3198 021 31030	10 k 0.063W
3305	3198 021 52240	220 k 0.1W
3306	2120 108 92624	4.7 k 1%
3307▲	2322 205 33229	22 R FUSE
3308▲	2120 106 90633	100 R
3309	2322 156 23309	33 R 1%
3312	3198 021 51080	1 R
3314	2322 156 21508	1.5 R 1%
3315	3198 012 32230	22 k 3W
3316▲	2322 205 33229	22 R FUSE
3318▲	2322 207 33102	1 k FUSE NFR25H
3319	3198 011 04780	4.7 R 0.17W
3320	3198 011 03340	330 k 0.17W
3321	3198 021 32240	200 k 0.063W
3324▲	2322 242 13335	3.3 M
3325▲	2322 242 13335	3.3 M
3326	2120 103 90018	220 R
3327	3198 011 01820	1.8 k 0.17W

3328	2322 156 23309	33 R 1%
3329	3198 011 04730	47 k 0.17W
3330	3198 021 34710	470 R 0.063W
3331	2322 156 21508	1.5 R 1%
3332	3198 021 34710	470 R 0.063W
3334	3198 011 01210	120 R 0.17W
3336	2120 108 92632	33 k 1%
3343	3198 021 31040	100 k 0.063W
3344	3198 021 32230	22 k 0.063W
3345	3198 021 34730	47 k 0.063W
3347	3198 021 51080	1 R
3350	3198 021 31040	100 k 0.063W
3351	3198 021 31030	10 k 0.063W
3352	3198 021 31030	10 k 0.063W
3353	3198 021 34720	4.7 k 0.063W
3459	3198 021 32210	220 R 0.063W
3460	3198 021 52230	22 k 0.1W
3461	3198 021 54710	470 R 0.1W
3462	3198 021 34710	470 R 0.063W
3463	3198 021 34710	470 R 0.063W
3464▲	2322 205 33228	2.2 R NFR25
3465	2322 193 95074	0.47 R
3466	3198 021 34710	470 R 0.063W
3467	3198 021 51080	1 R
3468	3198 021 58230	82 k 0.1W
3470	3198 021 32210	220 R 0.063W
3471	3198 021 34720	4.7 k 0.063W
3472	3198 021 33310	330 R 0.063W
3473	3198 021 35620	5.6 k 0.063W
3474	3198 021 54730	47 k 0.1W
3475	3198 011 01830	18 k 0.17W
3476	3198 011 01040	100 k 0.17W
3477	2120 101 74274	270 k
3478	2120 101 74274	270 k
3479	3198 021 32250	2.2 M 0.063W
3480	3198 011 03910	390 R 0.17W
3481	3198 011 03330	33 k 0.17W
3482	3198 011 03330	33 k 0.17W
3484	3198 011 01030	10 k 0.17W
3485	3198 011 04720	4.7 k 0.17W
3486	3198 011 01030	10 k 0.17W
3489	3198 011 03910	390 R 0.17W
3490	2120 108 93963	200 k 0.1W
3502	3198 021 36830	68 k 0.063W
3503	3198 021 38210	820 R 0.063W
3504	3198 011 01010	100 R 0.17W
3505	3198 011 01010	100 R 0.17W
3506	3198 021 38210	820 R 0.063W
3507	3198 021 33320	3.3 R 0.063W
3508	2120 108 91725	270 k 0.1W
3509	3198 021 53320	3.3 k 0.1W
3510	3198 011 04790	47 R 0.17W
3512	3198 011 04790	47 R 0.17W
3521	3198 021 31010	100 R 0.063W
3530	3198 021 34720	4.7 k 0.063W
3531	3198 021 31040	100 k 0.063W
3532	3198 021 32230	22 k 0.063W
3533	3198 021 31530	15 k 0.063W
3534	3198 021 34720	4.7 k 0.063W
3535	3198 021 34720	4.7 k 0.063W
3536	3198 021 32220	2.2 k 0.063W
3537	3198 021 32220	2.2 k 0.063W
3538	3198 021 34720	4.7 k 0.063W
3539	3198 021 31060	10 M 0.063W
3540	3198 021 31060	10 M 0.063W
3541	3198 021 33330	33 k 0.063W
3542	3198 021 33330	33 k 0.063W
3543	3198 021 33330	33 k 0.063W
3544	3198 021 33330	33 k 0.063W
3545	3198 021 33330	33 k 0.063W
3546	3198 021 33330	33 k 0.063W
3547	3198 021 31030	10 k 0.063W
3548	3198 021 53940	390 k 0.1W
3549	3198 021 31030	10 k 0.063W
3550	3198 021 31030	10 k 0.063W
3601	3198 021 34730	47 k 0.063W
3602	3198 011 04730	47 k 0.17W
3603	3198 021 38220	8.2 k 0.063W
3604	3198 021 38220	8.2 k 0.063W
3605	3198 021 32250	2.2 M 0.063W
3606	3198 021 32730	27 k 0.063W
3607	3198 021 33320	3.3 R 0.063W
3608	3198 011 01210	120 R 0.17W
3609	3198 011 01210	120 R 0.17W
3610	3198 021 31030	10 k 0.063W
3611	3198 021 33320	3.3 R 0.063W
3612	3198 021 34750	4.7 M 0.063W
3613	3198 021 33390	33 R 0.063W
3614	3198 021 31830	18 k 0.063W
3615	3198 021 32240	200 k 0.063W
3616	3198 021 34720	4.7 k 0.063W
3617	3198 021 34720	4.7 k 0.063W
3619	3198 021 31030	10 k 0.063W
3621	3198 021 32230	22 k 0.063W
3622	3198 021 31230	12 k 0.063W
3623	3198 021 32220	2.2 k 0.063W
3624	3198 021 35610	560 R 0.063W
3625	2120 368 90126	100 k POT
3626	3198 021 34730	47 k 0.063W
3627	3198 021 38220	8.2 k 0.063W
3629	3198 021 31230	12 k 0.063W
3630	3198 021 31090	10 R 0.063W
3631	3198 021 32290	22 R 0.063W
3632	3198 021 31230	12 k 0.063W
3633	3198 021 32220	2.2 k 0.063W
3634	3198 021 34730	47 k 0.063W
3635	3198 021 33330	33 k 0.063W
3636	3198 021 53940	390 k 0.1W
3637	3198 021 31510	150 R 0.063W
3638	2120 109 09158	1.5 R
3639	3198 021 34730	47 k 0.063W
3640	3198 021 35610	560 R 0.063W
3641	3198 021 36810	680 R 0.063W
3642	3198 021 32230	22 k 0.063W
3644	3198 021 31040	100 k 0.063W
3650	2120 108 92633	39 k 1%
3651	3198 011 01010	100 R 0.17W
3652	3198 011 01010	100 R 0.17W
3653	3198 021 31020	1 k 0.063W
3654	3198 021 33330	33 k 0.063W
3655	3198 021 32720	2.7 k 0.063W
3656	3198 021 33330	33 k 0.063W
3657	3198 021 32720	2.7 k 0.063W
3658	3198 021 34710	470 R 0.063W
3659	3198 021 34750	4.7 M 0.063W
3660	3198 021 31040	100 k 0.063W
3661	3198 021 51040	100 k 0.1W
3700	3198 021 34710	470 R 0.063W
3701	3198 021 33930	39 k 0.063W
3702	3198 021 31040	100 k 0.063W
3703	3198 021 31830	18 k 0.063W
3704	3198 021 33330	33 k 0.063W
3705	3198 011 06810	680 R 0.17W
3706	3198 021 33310	330 R 0.063W
3707	2120 368 90124	22 k POT
3708	3198 021 51830	18 k 0.1W
3709	3198 021 31540	150 k 0.063W
3710	3198 021 32210	220 R 0.063W
3711	3198 021 33320	3.3 R 0.063W
3712	3198 021 31020	1 k 0.063W
3714	3198 021 51010	100 R 0.1W
3715	3198 021 53310	330 R 0.1W
3715	3198 021 52210	220 R 0.1W
3716	3198 011 02220	2.2 k 0.17W
3717	3198 021 32720	2.7 k 0.063W
3718	3198 021 32220	2.2 k 0.063W
3719	3198 021 36820	6.8 k 0.063W
3720	3198 021 34710	470 R 0.063W
3721	3198 021 34720	4.7 k 0.063W
3722	3198 021 51010	100 R 0.1W
3723	3198 021 31010	100 R 0.063W
3724	3198 021 32230	22 k 0.063W
3725	3198 021 34710	470 R 0.063W
3726	3198 011 01020	1 k 0.17W
3727	3198 021 35620	5.6 k 0.063W
3728	3198 021 35620	5.6 k 0.063W
3729	3198 021 35620	5.6 k 0.063W
3730	2120 368 90126	100 k POT
3731	3198 011 04710	470 R 0.17W
3732	3198 021 33310	330 R 0.063W
3733	3198 021 32720	2.7 k 0.063W
3734	3198 021 31510	150 R 0.063W
3762	3198 021 35620	5.6 k 0.063W
3763	3198 021 90030	jumper
3764	3198 021 34730	47 k 0.063W
3765	3198 011 01010	100 R 0.17W
3766	3198 011 01010	100 R 0.17W
3767	3198 011 01010	100 R 0.17W
3768	3198 021 35620	5.6 k 0.063W
3769	3198 011 01010	100 R 0.17W
3770	3198 021 31020	1 k 0.063W
3771	2120 108 91686	7.5 k
3775	3198 021 54710	470 R 0.1W
3776	3198 021 34710	470 R 0.063W
3796	3198 021 31020	1 k 0.063W
3797	3198 011 01020	1 k 0.17W
3798	3198 011 01020	1 k 0.17W
3799	3198 011 01020	1 k 0.17W
3800▲	2120 106 90597	10 R FUSE
3801	3198 021 32730	27 k 0.063W
3802	3198 011 04780	4.7 R 0.17W
3803	3198 021 32220	2.2 k 0.063W
3804	3198 021 35630	56 k 0.063W
3805▲	2120 106 90597	10 R FUSE
3806	3198 021 54730	47 k 0.1W
3807	3198 021 31040	100 k 0.063W
3808	3198 011 03310	330 R 0.17W
3809	3198 011 03310	330 R 0.17W
3810	3198 011 03310	330 R 0.17W
3811	3198 011 03310	330 R 0.17W
3812	3198 011 08210	820 R 0.17W
3813	3198 021 31030	10 k 0.063W
3814	3198 021 32210	220 R 0.063W
3815	3198 021 33330	33 k 0.063W
3816	3198 011 04710	470 R 0.17W
3817	3198 011 04710	470 R 0.17W
3818	3198 021 36820	6.8 k 0.063W
3819	3198 011 01030	10 k 0.17W
3820	3198 011 04710	470 R 0.17W
3821	3198 011 01010	100 R 0.17W
3822	3198 021 34730	47 k 0.063W
3823	3198 021 34730	47 k 0.063W
3824	3198 011 01030	10 k 0.17W
3825	3198 011 01010	100 R 0.17W
3826	3198 021 31030	10 k 0.063W
3827	3198 011 01020	1 k 0.17W
3828	3198 021 31030	10 k 0.063W
3829	3198 021 31020	1 k 0.063W
3830	3198 021 32210	220 R 0.063W
3831	3198 021 32220	2.2 k 0.063W
3832	3198 021 31030	10 k 0.063W
3833	3198 011 01030	10 k 0.17W
3834	3198 021 34710	470 R 0.063W
3835	3198 011 08220	8.2 k 0.17W
3836	3198 011 01020	1 k 0.17W
3837	3198 011 01030	10 k 0.17W
3838	3198 011 01030	10 k 0.17W
3839	3198 021 51030	10 k 0.1W
3840	3198 021 31020	1 k 0.063W
3841	3198 021 31020	1 k 0.063W
3842	3198 011 08220	8.2 k 0.17W
3843	3198 021 31020	1 k 0.063W
3844	3198 011 01030	10 k 0.17W
3845	3198 021 31020	1 k 0.063W
3846	3198 011 01010	100 R 0.17W
3847	3198 021 32220	2.2 k 0.063W
3848	3198 011 01010	100 R 0.17W
3849	3198 021 34710	470 R 0.063W
3850	3198 011 01030	10 k 0.17W
3851	3198 011 02220	2.2 k 0.17W
3852	3198 011 02220	2.2 k 0.17W
3853	3198 021 34710	470 R 0.063W
3854	3198 021 32230	22 k 0.063W
3855	3198 021 32220	2.2 k 0.063W
3856	3198 011 02220	2.2 k 0.17W
3857	3198 021 31030	10 k 0.063W
3858	3198 011 01030	10 k 0.17W
3859	3198 021 31020	1 k 0.063W
3860	3198 021 34720	4.7 k 0.063W
3861	3198 021 34710	470 R 0.063W
3862	3198 011 04730	47 k 0.17W
3863	3198 021 31530	15 k 0.063W
3864	3198 021 34730	47 k 0.063W
3865	3198 021 31830	18 k 0.063W
3866	3198 021 31020	1 k 0.063W
3867	3198 011 01030	10 k 0.17W
3868	3198 011 01030	10 k 0.17W
3869	3198 021 31020	1 k 0.063W
3870	3198 021 31830	18 k 0.063W
3871	3198 021 31030	10 k 0.063W
3872	3198 021 51020	1 k 0.1W
3874	3198 021 31830	18 k 0.063W
3875	3198 021 34720	4.7 k 0.063W
3876	3198 021 34720	4.7 k 0.063W
3878	3198 021 32220	2.2 k 0.063W
3879	3198 021 31030	10 k 0.063W
3880	3198 021 31080	1 R 0.063W
3881	3198 021 51830	18 k 0.1W
3882	3198 011 01030	10 k 0.17W
3883	3198 021 32230	22 k 0.063W
3885	3198 021 51080	1 R
3886	3198 011 03920	3.9 k 0.17W
3887	3198 021 32230	22 k 0.063W
3888	3198 021 32230	22 k 0.063W
3889	3198 021 31030	10 k 0.063W
3890	3198 011 01030	10 k 0.17W
3891	3198 021 34720	4.7 k 0.063W
3896	3198 021 34720	4.7 k 0.063W
3897	3198 021 34730	47 k 0.063W
3898	3198 021 31520	1.5 k 0.063W
3899	3198 011 01030	10 k 0.17W
3901	3198 021 32220	2.2 k 0.063W
3901	3198 021 51030	10 k 0.1W
3902	3198 021 37590	75 R 0.063W
3903	2122 551 00008	VDR MAX 21V
3903	2322 574 10402	VDR MAX 21V
3904	2122 551 00008	VDR MAX 21V
3904	2322 574 10402	VDR MAX 21V
3905	2122 551 00008	VDR MAX 21V
3905	2322 574 10402	VDR MAX 21V
3906	2322 574 10402	VDR MAX 21V
3906	2122 551 00008	VDR MAX 21V

3907	2122 551 00008	VDR MAX 21V
3907	2322 574 10402	VDR MAX 21V
3908	2322 574 10402	VDR MAX 21V
3908	2122 551 00008	VDR MAX 21V
3909	2122 551 00008	VDR MAX 21V
3909	2322 574 10402	VDR MAX 21V
3910	3198 021 31040	100 k 0.063W
3911	3198 021 31040	100 k 0.063W
3912	3198 021 37590	75 R 0.063W
3913	3198 021 37590	75 R 0.063W
3914	3198 021 36820	6.8 k 0.063W
3915	2322 574 10402	VDR MAX 21V
3915	2122 551 00008	VDR MAX 21V
3916	3198 021 56820	6.8 k 0.1W
3917	3198 021 34720	4.7 k 0.063W
3918	3198 021 36820	6.8 k 0.063W
3919	3198 021 51040	100 k 0.1W
3920	3198 011 06820	6.8 k 0.17W
3921	3198 021 37590	75 R 0.063W
3922	3198 011 02210	220 R 0.17W
3923	3198 021 32210	220 R 0.063W
3924	3198 011 02210	220 R 0.17W
3925	3198 021 52210	220 R 0.1W
3926	3198 021 31040	100 k 0.063W
3927	3198 021 34720	4.7 k 0.063W
3928	3198 021 34710	470 R 0.063W
3929	3198 021 37590	75 R 0.063W
3930	3198 021 32210	220 R 0.063W
3931	3198 021 32210	220 R 0.063W
3932	3198 021 32210	220 R 0.063W
3933	3198 021 52210	220 R 0.1W
3934	3198 021 34710	470 R 0.063W
3935	3198 021 34790	47 R 0.063W
3936	3198 021 31030	10 k 0.063W
3937	3198 021 34790	47 R 0.063W
3938	3198 021 31020	1 k 0 063W
3939	3198 011 08210	820 R 0.17W
3940	3198 021 32210	220 R 0 063W
3941	3198 021 32210	220 R 0.063W
3942	3198 021 33910	390 R 0.063W
3943	3198 021 31030	10 k 0.063W
3944	3198 021 36830	68 k 0.063W
3945	3198 021 36820	6.8 k 0.063W
3946	3198 021 34720	4.7 k 0.063W
3947	3198 021 34790	47 R 0.063W
3948	3198 021 51010	100 R 0.1W
3949	3198 011 01010	100 R 0.17W
3953	3198 011 01040	100 k 0.17W
3954	3198 021 51040	100 k 0.1W
3955	3198 021 31040	100 k 0.063W
3957	2122 551 00008	VDR MAX 21V
3957	2322 574 10402	VDR MAX 21V
3958	2122 551 00008	VDR MAX 21V
3958	2322 574 10402	VDR MAX 21V
3959	2122 551 00008	VDR MAX 21V
3959	2322 574 10402	VDR MAX 21V
3960	2122 551 00008	VDR MAX 21V
3960	2322 574 10402	VDR MAX 21V
3961	3198 021 51080	1 R
3961	3198 021 31510	150 R 0.063W
3962	3198 011 06820	6.8 k 0.17W
3962	3198 011 01020	1 k 0.17W
3963	3198 021 51010	100 R 0.1W
3964	3198 021 31010	100 R 0.063W
965	3198 021 31010	100 R 0.063W
966	3198 011 06820	6.8 k 0.17W
966	3198 011 01020	1 k 0.17W
967	3198 021 51010	100 R 0.1W

000	2422 535 97877	10 µH
001	2422 535 97877	10 µH
002	2422 535 97877	10 µH
003	2422 535 97877	10 µH
004	3198 018 15690	56 µH
005	3198 018 11090	10 µH
006	3198 018 11010	100 µH
007	2422 535 94885	470 µH
071	3198 018 16880	6.8 µH
072	2422 535 97877	10 µH
73	3198 018 15690	56 µH
74	3198 018 12290	22 µH
75	3198 018 12790	27 µH
70	2422 535 97877	10 µH
00	3198 018 90020	BEAD 100mH z
01▲	3128 138 39060	MAINS TRANSFORMER
02	3198 018 21090	10 µH
04	2422 535 94639	10 µH
05▲	2422 549 44287	MAINS TER
06▲	2422 535 94674	330 nH
07	3198 018 90080	COIL
08	3198 018 90080	COIL

5460▲	2422 535 94674	330 nH
5500	3198 018 11090	10 µH
5501	3198 018 11090	10 µH
5502	3198 018 11090	10 µH
5600	3103 138 24910	COIL ASSY
5601	2422 549 44607	EMI100mH z 600RR
5602	2422 549 44607	EMI100mH z 600RR
5603	2422 549 44607	EMI100mH z 600RR
5604	2422 549 44607	EMI100mH z 600RR
5605	3198 018 90080	COIL
5610	2422 535 97877	10 µH
5650	3198 018 26880	6.8µH
5651	3198 018 12290	22 µH
5701	3198 018 11590	15 µH
5701	3198 018 11090	10 µH
5702	2422 549 44162	COIL VAR
5703	3198 018 90080	COIL
5704	2422 549 44162	COIL VAR
5706	3198 018 16880	6.8 µH
5707	2422 535 97875	6.8 µH
5708	3198 018 11090	10 µH
5709	3198 018 90090	COIL
5710	3198 018 13990	39 µH
5760	3198 018 21090	10 µH
5761	3198 018 21010	COIL
5762	3198 018 21090	10 µH
5901	2422 535 97877	10 µH
5904	2422 535 94306	COIL
5905	3198 018 90080	COIL
5906	3198 018 90080	COIL

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6170	9322 155 82667	IR SENSOR TSOP2236
6171	9336 247 60133	BAT85
6300	9337 234 20133	BYD33J
6301	9322 103 46673	SBYV27-200
6302	9322 126 71673	BYT42M
6304	9334 515 80673	1N4003
6305	9334 515 80673	1N4003
6306	9337 234 00133	BYD33D
6307	3198 010 10070	BAV21
6308	9337 234 00133	BYD33D
6309	9322 128 68682	SB360
6310	9338 386 60673	1N4006GP
6311	9338 386 60673	1N4006GP
6312	9338 386 60673	1N4006GP
6313	9338 386 60673	1N4006GP
6315	3198 010 54780	BZX79-B4V7
6316	3198 010 53980	BZX79-B3V9
6317	9322 128 15685	MCL4148(TEGO)R
6460	3103 138 87290	Kit: 2x Sens. + 1x LED
6601	9322 145 52685	BZM55-B7V5 R
6602	9322 129 41685	BZM55C12
6702	9340 255 20115	BA792
6760	3198 010 10010	1N4148
6761	9322 128 15685	DIO SIG MCL4148
6801	9336 247 60133	BAT85
6802	9340 386 40115	BZX284-C6V8
6802	9322 129 38685	BZM55-C6V8
6803	9322 129 38685	BZM55-C6V8
6803	9340 386 40115	BZX284-C6V8
6804	3198 010 10010	1N4148
6805	3198 010 10010	1N4148
6901	9340 386 40115	BZX284-C6V8
6902	9322 032 16673	MTZJ12C
6903	9322 032 16673	MTZJ12C
6904	9322 129 41685	BZM55C12
6905	9340 386 40115	BZX284-C6V8
6905	9322 129 38685	BZM55-C6V8
6906	9322 129 38685	BZM55-C6V8
6907	9322 129 41685	BZM55C12
6908	9340 386 40115	BZX284-C6V8
6908	9322 129 38685	BZM55-C6V8
6909	9322 129 41685	BZM55C12
6910	9322 129 41685	BZM55C12
6911	9340 386 40115	BZX284-C6V8
6911	9322 129 38685	BZM55-C6V8
6912	9340 386 40115	BZX284-C6V8
6912	9322 129 38685	BZM55-C6V8
6913	9322 129 41685	BZM55C12

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7002	9330 921 11215	BFS20
7003	9330 921 11215	BFS20
7004	8203 107 03610	LA71595BM(TSAJ)
7005	3198 010 42310	BC847BW
7006	3198 010 42320	BC857BW
7008	3198 010 42310	BC847BW
7009	3198 010 44220	DTA124EU
7010	3198 010 42310	BC847BW
7071	3198 010 42320	BC857BW
7072	9322 147 59682	LA7339A
7073	3198 010 42310	BC847BW
7075	3198 010 42310	BC847BW
7077	3198 010 42310	BC847BW
7170	2722 171 07186	DISPLAY
7172	3198 010 44320	DTC124EU
7300▲	9322 127 19682	OPT CP TCET1101G
7301	9322 086 97676	TL431ACZ-AP S
7302▲	9322 162 02687	FET POW STP4NC60
7303	9322 136 56682	MC44608P40
7306	9322 163 75685	FET SIG SI2306DS(VISH)
7307	3198 010 44320	DTC124EU
7308	3198 020 43430	BC327-25
7309	3198 010 42310	BC847BW
7310	3198 010 44320	DTC124EU
7315	3198 010 42310	BC847BW
7316	3198 010 42320	BC857BW
7350	3198 020 43530	BC337-25
7351	3198 010 42320	BC857BW
7461	3103 138 87290	Kit: 2x Sens. + 1x LED
7462	3103 138 87290	Kit: 2x Sens. + 1x LED
7463	9322 164 65668	M63100BFP(MITJ) L
7464	9322 097 89682	OPT CP TCRT5000L
7465	9322 097 89682	OPT CP TCRT5000L
7466	9322 097 91682	OPT CP TCST1030L
7501	3198 010 42320	BC857BW
7502	9322 136 21668	SDA5652-2X
7530	9339 476 70668	LM339DT
7531	3198 010 42310	BC847BW
7532	3198 010 42310	BC847BW
7601	3198 010 42310	BC847BW
7602	9335 897 30215	BC856B
7603	9331 795 40126	BC327-40
7604	9335 895 60215	BC846B
7606	3198 010 42310	BC847BW
7607	9335 895 60215	BC846B
7608	3198 010 43240	BC817-40
7650	9352 631 46557	TDA9605H/N2
7701	9333 729 60653	HEF4053BT
7702	3198 010 44320	DTC124EU
7703	3198 010 42310	BC847BW
7704	3198 010 42320	BC857BW
7705	9352 606 11118	TDA9818T/V1 R
7705	9352 621 13118	TDA9817T/V1 R
7706	3198 010 42310	BC847BW
7760	9352 640 81557	TDA9873HZ
7761	9322 147 97668	MSP3415D-QG-B3
7800	3198 010 42310	BC847BW
7801	3198 010 42310	BC847BW
7802	3198 010 42310	BC847BW
7803	3198 010 42320	BC857BW
7804	3198 020 43530	BC337-25
7807	3198 010 42310	BC847BW
7808	3198 010 42310	BC847BW
7809	3198 010 44220	DTA124EU
7811	3198 010 42310	BC847BW
7812	9331 795 40126	BC327-40
7818	9322 120 64668	M24C08-MN6
7818	9322 121 51668	M24C16-MN6 (ST00) R
7899	3103 165 13570	TMP93CT76F/AC3P1-xU
7899	3103 165 13590	TMP93CW76F/AC3P7-xU
7899	3103 165 13580	TMP93CW76F/AC3B1-xU
7904	9322 124 28682	STV6401
7905	3198 010 42040	BC847C
7906	3198 010 42040	BC847C
7907	3198 010 42310	BC847BW
7908	3198 010 42310	BC847BW
7909	3198 010 42320	BC857BW
7910	3198 010 42310	BC847BW
7911	9333 729 60653	HEF4053BT
7912	3198 010 42310	BC847BW
7913	3198 010 43240	BC817-40
7914	3198 010 42310	BC847BW
9759	3198 021 90020	JUMPER

ACP1/ACP10

Various

1950	2422 025 14535	CONNECTOR 6PIN
1951	3103 100 24170	CINCH YELLOW
1952	3103 100 24160	CINCH RED
1953	3103 100 24150	CINCH WHITE

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2401	2222 861 14471	470 pF
2402	2238 910 15649	100 nF 25V
2403	3198 017 21050	1 µF 16V
2404	2222 861 14471	470 pF
2405	3198 017 21050	1 µF 16V
2406	2238 910 15649	100 nF 25V
2412	2122 551 00008	VDR MAX 21V

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3000	2422 549 41993	IND FXD100M HZ600Ω
3401	3198 021 57590	75 R 0.1W
3402	3198 021 51050	1 M 0.1W
3403	3198 021 51050	1 M 0.1W
3404	3198 021 54740	470 k 0.1W
3405	3198 021 56840	680 k 0.1W
3406	3198 021 54720	4.7 k 0.1W
3407	3198 021 54740	470 k 0.1W
3408	3198 021 56840	680 k 0.1W
3409	3198 021 54720	4.7 k 0.1W
3410	3198 021 51510	150 R 0.1W
3420	2122 551 00008	VDR MAX 21V
3421	2122 551 00008	VDR MAX 21V
3900	3198 021 90020	CHIP jumper
3901	3198 021 90020	CHIP jumper
3902	3198 021 90020	CHIP jumper
3903	3198 021 90020	CHIP jumper

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5001	2422 535 94342	220 µH
5002	2422 535 94342	220 µH
5003	2422 535 94338	100 µH
5004	2422 535 94338	100 µH

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6000	3198 010 21290	BZX79-C12
6000	9340 387 00115	BZX284-C12 for ACP10 only
6001	3198 010 21290	BZX79-C12
6001	9340 387 00115	BZX284-C12 for ACP10 only
6002	3198 010 21290	BZX79-C12
6002	9340 387 00115	BZX284-C12 for ACP10 only
6003	3198 010 21290	BZX79-C12
6003	9340 387 00115	BZX284-C12 for ACP10 only

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7001	3198 010 42040	BC847C
7002	3198 010 42040	BC847C

QBOE1/QBOG1

Various

1103	2422 025 14535	CONNECTOR 6PIN
1106	3103 100 23840	CINCH WHITE
1107	3103 100 23830	CINCH RED
1108	3103 100 23820	CINCH YELLOW

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2401	3198 016 04710	470 pF 50V
2402	3198 017 21040	100 nF 50V
2403	3198 017 21050	1 µF 16V
2404	3198 016 04710	470 pF 50V
2405	3198 017 21050	1 µF 16V
2406	3198 017 21040	100 nF 50V
2410	2122 551 00008	VDR MAX 21V
2411	2122 551 00008	VDR MAX 21V
2412	2122 551 00008	VDR MAX 21V

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3401	3198 021 57590	75 R 0.1W
3402	3198 021 51050	1 M 0.1W
3403	3198 021 51050	1 M 0.1W
3404	3198 021 54740	470 k 0.1W
3405	3198 021 56840	680 k 0.1W
3406	3198 021 54720	4.7 k 0.1W
3407	3198 021 54740	470 k 0.1W
3408	3198 021 56840	680 k 0.1W
3409	3198 021 54720	4.7 k 0.1W
3410	3198 021 51510	150 R 0.1W
3903	3198 021 90020	CHIP jumper

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5001	3198 018 02210	220 µF
5002	3198 018 02210	220 µF
5003	3198 018 01010	100 µF
5004	3198 018 01010	100 µF
5005	2422 549 41993	100mH z 600R

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6000	9322 129 41685	BZM55C12
6000	9322 129 30673	BZM55C12 for QBOG1 only
6001	9322 129 41685	BZM55C12
6001	9322 129 30673	BZM55C12 for QBOG1 only
6002	9322 129 41685	BZM55C12
6002	9322 129 30673	BZM55C12 for QBOG1 only
6003	9322 129 41685	BZM55C12
6003	9322 129 30673	BZM55C12 for QBOG1 only

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7001	3198 010 42080	BC848C
7002	3198 010 42080	BC848C

CABLES

8001	3103140
8002	3103140
8003	3103140
8004	3103140
8005	3103140
8006	3103140

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SUB MODU

3103 19
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